

2016 RPD MANUAL

The primary purpose of removable partial denture therapy must always be
“the preservation of that which remains, and not the meticulous replacement of that which has
been lost.”
-MM DeVan

Indications for RPD's

1. No abutment tooth posterior to the edentulous space
2. Long-span edentulous area
3. Reduced periodontal support for the remaining teeth to be used as FPD abutments
4. Excessive bone loss in the edentulous areas
5. Esthetic concerns but the patient has limited resources
6. Need for immediate replacement of the extracted teeth(Interim prosthesis)
7. Patient's request

Data Collection for Removable prosthodontic patient

Patient History

Chief complaint and its history

Medical history review

Dental history review, especially related to previous prosthetic experience(s)

Patient expectations

Radiographic examination

FMS or Panoramic radiographs + PA's of the proposed abutments (if FMS is not available)

Intra-oral examination

Height of the floor of the mouth

Location of frenum attachment adjacent to the abutment teeth

Full mouth Perio and Odont Charting

Evaluation of the potential abutments

Periodontal evaluation-

Crown-root ratio

Mobility

Need of extended periodontal treatment/ splinting

Prognosis

Restorative evaluation-

Condition of the existing restoration

Extent of the caries lesion

Vitality test (All RPD abutment teeth)

Material consideration in of potential rest seats / guide planes locations

Occlusal evaluation

The location of the teeth in relation to the ideal occlusal plane

Stable occlusal relationship

Location of the occlusal contacts

Identification of excessive wear/ occlusal problems

The initial RPD design will be done based on your accurate data collection.

Armamentarium

Triad record base material(pink)

Pink base plate wax sheet

Sticky wax

Plaster carving tool or PKT instrument # 3

7 wax spatula

31 wax spatula

Bar-Parker knife with # 25 blade

Regular # 2 graphite pencil

Red and Blue pencil

Model releasing agent (MRA)

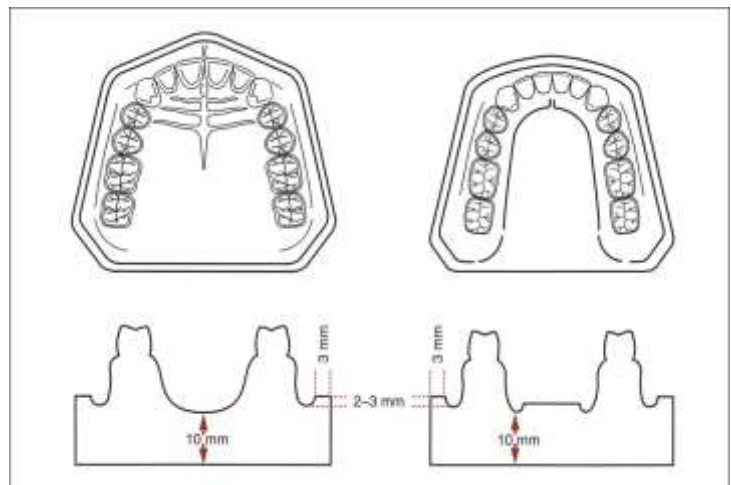
Air Barrier coating(ABC)

Overview

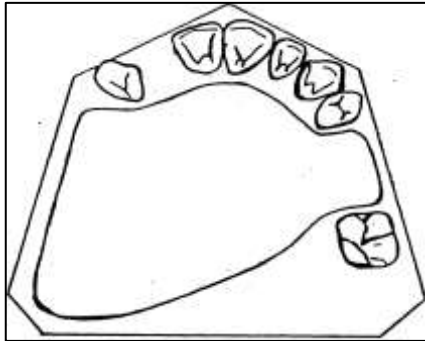
After the visit #1, the collected data needs to be confirmed and transferred to the simulation instrument, which is the articulator. Due to the nature of partial edentulism, a set of maxillary and mandibular record bases and occlusal rims will be fabricated before visit #2. The proper jaw relation record will be recorded during this visit, in order to mount the diagnostic casts.

Objectives

1. To identify anatomical landmarks and undercuts.
2. To determine the proper extension of record bases and the dimension of wax rims.



3. To fabricate the record bases with Triad
4. To fabricate the wax rims



Procedures

1. Once the diagnostic casts are fabricated and trimmed to the proper dimension, defects and



- irregularities on the occlusal surfaces and surface of soft tissue area should be carefully removed to allow the fabrication of a smooth, accurate record base.
2. The tongue space should be trimmed flat, while maintaining the integrity of the lingual frenum and the lingual sulcus. Nodules of stone caused by voids in the impression should be carefully removed with a sharp carver or the Barr-Parker knife.
 3. Use the graphite pencil as a parallelometer to identify possible undercut in the edentulous areas.
 4. Mark the extension of record bases with BLUE pencil

When do we need record bases with occlusal rims?

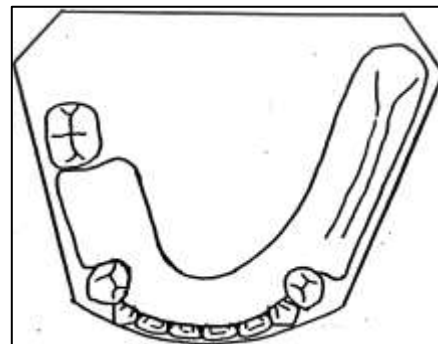
Record bases with occlusion rims must be used

- a. when one or more distal extension areas are present,
- b. when tooth-bounded edentulous spaces are large, or
- c. when opposing teeth do not meet.

Record bases usually are constructed chemically-activated or light-activated acrylic resins.

Record bases must accurately fit the diagnostic casts and the patient's mouth. Record bases must be comfortable, rigid, stable when placed in the oral cavity.

All surfaces that contact the lips, cheeks, tongue should be smooth, rounded, and polished. Borders must not interfere with the functional activity of the surrounding tissues. As a result, the borders of a record base should be slightly under-extended. Overextension of borders often will produce instability of the record base and inaccuracy of the diagnostic mounting.



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Sufficient area should be covered by the base to provide stability. The areas that will be covered should be outlined in BLUE pencil before the acrylic resin is placed. The specific areas to cover for the record base are:

The maxillary record bases	The mandibular record bases
Residual ridges (Extended into the vestibule, without impinging the frenii)	Residual ridges (Extended into the vestibule, without impinging the frenii)
Well adapted to the Hard palate	Retromolar pads
	Buccal shelf area
Anteriorly, the record base should lightly contacting the lingual surface remaining teeth without interfere with occlusal contacts	The record base should not be interfering with the lingual frenum and should extend up half way occluso-gingivally of the lingual surface of anterior teeth.
The posterior border should not pass beyond the vibrating line (Fovea palatini, Hamular notches)	Lingual flanges should not extend beyond mylohyoid lines

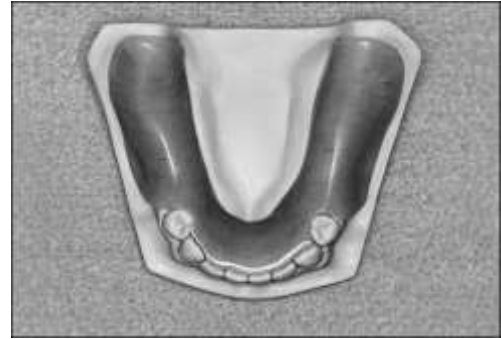
5. Before applying the Triad record base material to construct the base, all undercuts must be blocked out on the study casts.
 1. Use graphite pencil to outline the possible undercut area.
 2. The proper amount of baseplate wax necessary to remove tooth and tissue undercuts is placed in the undercuts with a hot No. 31 or # 7 spatula. If the areas are not blocked out, either the cast or base could be fractured on removal of the Triad. The most frequent areas that require block out are:
 - a. Retromylohyoid fossa
 - b. Buccal pouch
 - c. Proximal surfaces of teeth next to edentulous areas or open embrasures.
 - d. Undercuts of the ridge
 - e. Lingual surfaces of posterior teeth
6. After the wax has been placed, the wax spatula or a surveyor may be used to make sure no further undercuts exist. The wax is then smoothed with the Micro torch by gently playing a flame over the blocked out areas.
7. When all the undercuts have been blocked out and the support area outlined, the cast is painted with Triad model release agent.

Triad record bases

8. Remove a sheet of pink Triad base material from its wrapper and apply it carefully to the diagnostic cast, making the posterior border of the sheet conform as closely as possible

to the pencil line on the cast marking the posterior border of the record base. Avoid trapping air in the palate by laying the Triad sheet down gradually from the posterior border toward the anterior. Using the fingers, a pencil eraser or the Triad modeling instrument lubricated with petrolatum or model release agent, GENTLY adapt to the palate first before edentulous ridge areas. Avoiding excess pressure will help keep you from making the Triad too thin, especially over the ridges. With a scalpel blade cut away the excess Triad from the areas beyond the outlines of the record bases.

9. Place the diagnostic cast with the adapted pink Triad base material in the Triad curing unit and cure for two minutes.

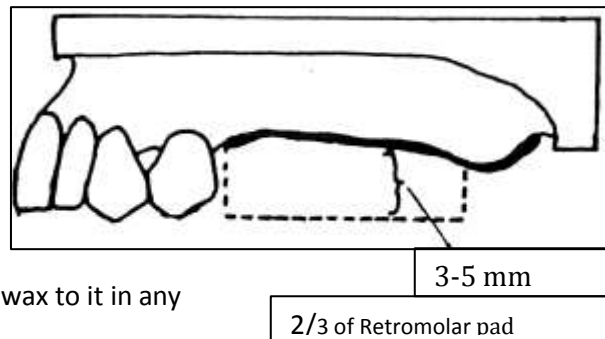


10. Gently remove the Triad record base from the cast, coat the entire base with thin layer of the air barrier, replace the base in the unit tissue side up and cure for six minutes additionally. Then remove the water-soluble air barrier coating with brush or gauze pads and water.

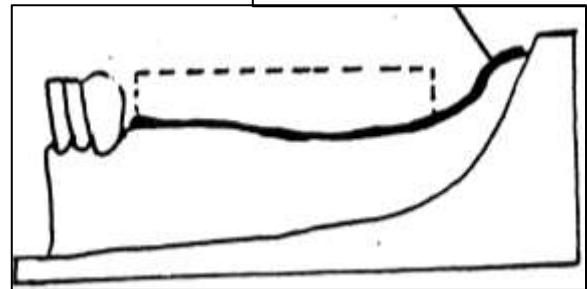
11. Trim any excess Triad material or rough areas with an arbor band or large acrylic resin trimming bur. Polish the rough Triad with fine or flour of pumice.

Wax Rims

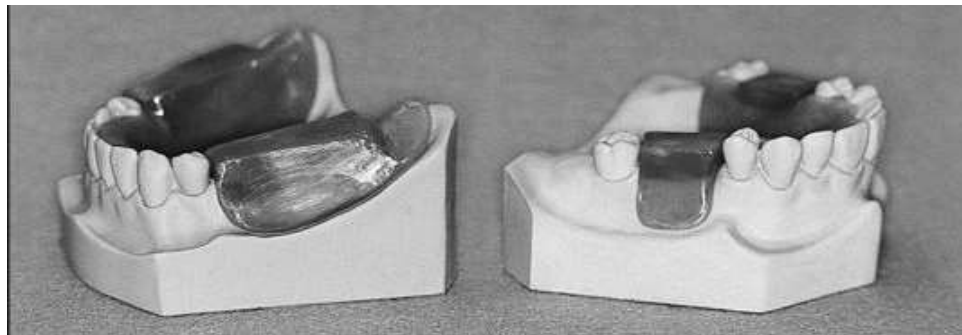
12. Before placing wax rims on resin bases melt a thin layer of sticky wax on the edentulous areas of the base. This will prevent the base plate wax from separating from the bases later. Always add sticky-wax first to a resin or metallic surface before adding base plate wax to it in any form.



13. The wax rims are made by thoroughly heating a quarter of a sheet of base plate wax and folding it in small increments until an approximate 10 mm x 10 mm. block is made. This block is heated and placed over the edentulous areas of the registration rims. This bulk of wax is trimmed until it is approximately 8 mm thickness buccolingually. The height of either registration rim depends in part upon the landmarks of the specific arch.



14. On the maxilla, the rim is as high anteriorly as the occlusal height of the tooth next to the edentulous area. The distal height of the posterior part of the rim should be approximately 4mm.
15. The height of the mandibular rim should be as high anteriorly as the occlusal height of the tooth next to the edentulous area. The posterior height should be approximately $\frac{2}{3}$ the distance up the retromolar pad.
16. Both the base and rim of the finished product should be clean and smooth. Patients notice small details, and a rough and/or dirty looking registration rim may prejudice the patient against the final prosthesis.
17. After the completed wax rims checked by the instructor, 2mm of wax should be removed from the occlusal surface of rims to provide space for Alu-wax, the jaw relation recording medium.



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Condition of the existing restoration

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Vitality test (All RPD abutment teeth)

Material consideration in of potential rest seats / guide planes locations

Occlusal evaluation

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Identification of excessive wear/ occlusal problems

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Treatment Sequence for Partial Dentures

If an RPD is part of planned Treatment:

PLAN THE RPD BEFORE BEGINNING ANY OTHER TREATMENT

The reasons for the prior design approval

- To ensure RPD can be completed successfully
- It will affect the material selection of direct restorations
- Can influence need for/preparations for survey crowns
- Can avoid unnecessary treatment to hopeless/questionable teeth
- Help sequencing the comprehensive treatment plan

VISIT ONE Data Collection for Removable prosthodontic patient

Patient History

- Chief complaint and its history
- Medical history review
- Dental history review, especially related to previous prosthetic experience(s)
- Patient expectations

Radiographic examination

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Intra-oral examination

Height of the floor of the mouth

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Diagnostic cast impression

The initial RPD design will be done based on your accurate data collection.

VISIT TWO Data Collection for Removable prosthodontic patient

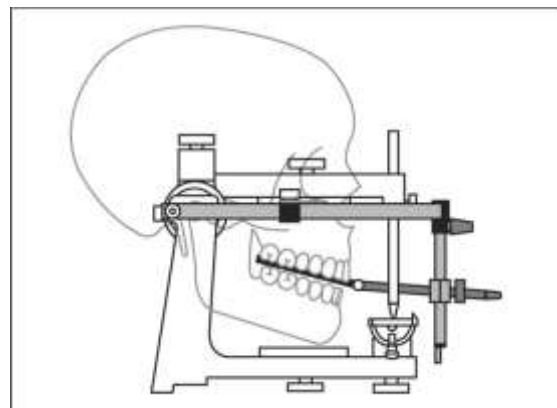
The emphasis of diagnostic visit # 2 is to analyze the data collected from the previous visit, and to correlate all findings, diagnostic casts and other data.

1. A thorough examination of the remaining teeth should be performed. Carious lesions and defective restorations should be correlated with radiographs and other diagnostic findings.
2. A complete periodontal examination should be accomplished. Oral structures should be evaluated to determine pocket depths, mobility, soft tissue attachment, furcation involvement, etc.
3. Teeth with suspected pulpal involvement should be tested for vitality.
4. All remaining teeth should be tested for sensitivity to percussion.
5. The oral tissues should be examined for evidence of pathologic changes.
6. The dental arches should be examined for the presence of tori, exostoses, sharp or prominent bony areas, soft or hard tissue undercuts, and/or enlarged tuberosities.
7. A radiographic examination should be performed with special attention focused on proposed abutments and the residual ridge areas.
8. Mounted casts should be examined for the presence of extruded or malposed teeth, reduced interarch space, unfavorable occlusal planes, and any other potential problems.
9. In mandibular applications, a suitable measuring device such as a periodontal probe should be used to determine the distance from the active floor of the mouth to the gingival margins of the mandibular teeth.
10. The diagnostic casts should be analyzed on a dental surveyor and appropriate removable partial denture designs should be generated.

Mounted Diagnostic casts

The primary objective of a diagnostic mounting procedure is to properly position the diagnostic casts on a dental articulator.

1. Accurately mounted diagnostic casts supplement examination of the oral cavity. Malpositioned teeth, low-hanging tuberosities, compromised interarch space, and defective restorations are readily apparent when accurate casts are correctly mounted on a suitable articulator.
2. Accurately mounted casts permit detailed analysis of a patient's occlusion. Mounted casts permit improved visual access, unimpeded by the patient's lips, cheeks, and tongue. Therefore, the dentist may evaluate occlusal relationships from facial and lingual perspectives. The resultant information may be essential in treatment planning and prosthesis design.
3. Mounted casts are helpful in patient education. By viewing accurately mounted casts, patients may gain an improved understanding of existing oral conditions, proposed treatment regimens, and potential difficulties.
4. Accurately mounted casts provide a record of the patient's condition before treatment. This record can be of great value if a conflict should arise during the course of treatment.



PROCEDURES

Step A: Orientation of the maxillary cast to the condylar elements of an articulator by means of a facebow transfer

In fixed prosthodontic course, the facebow transfer was done by placing layers of soften baseplate wax adapted to the bite fork. In removable prosthodontics, the partially edentulous maxillary cast might require extra support to obtain the “Tripod”.

If remaining teeth are widely distributed to form a tripod	Kennedy class III	1. 2 layers of baseplate wax adapted to bite fork 2. Lubricated maxillary cast seated into the soften wax to obtain registration of the cusp tips
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If one or two long distal extension edentulous area present,	Kennedy class I and Class II	1. Softened thermoplastic compound adapted to the bite fork. 2. Lubricated max cast with record base and occlusal rim seated into the soften compound
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If one or two short distal extension edentulous areas present	Kennedy class I and Class II	1. 2 layers of baseplate wax for teeth and 6 to 8 layers of wax for edentulous ridge built up on bite fork 2. Lubricated max cast seated into the “modified bite fork
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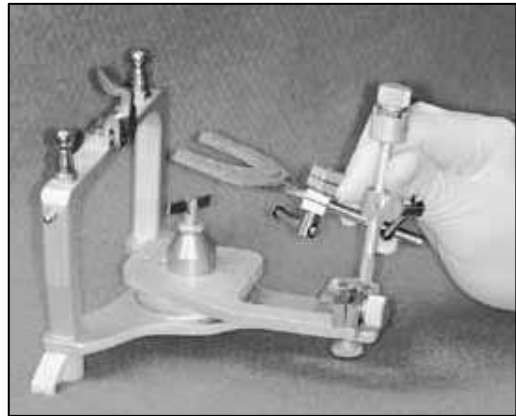
If one edentulous area presents in the anterior region	Kennedy class IV	Depend on the length of the edentulous ridge, a record base with occlusal rim might be necessary
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Sequence for Mounting Maxillary Cast to Axis-Orbital Plane

The initial steps allow recording of the maxilla–temporomandibular joint (TMJ) relationship:

1. Identify the anterior and posterior reference points for the facebow (e.g., external auditory meatus, nasion).
2. Prepare the bite fork and occlusion rim and verify the stability of the cast on the bite fork assembly
3. Place the bite fork centered to the arch, indexing it to the teeth with wax.
4. Place the facebow over the bite fork rod anteriorly.
5. Place the bow evenly into the ears posteriorly.
6. Secure the bow anteriorly by securing the nasion relator screw.
7. Position the bow anteriorly to the third point of reference (establishes the horizontal plane).
8. Secure the bite fork vertical rod, then the horizontal rod (holding the bow securely to prevent torque).
9. Release the bow anteriorly to allow spread, and disengage from the ears.
10. Remove the fork downward and out of the mouth with the attached bow.
11. Carefully check the security of the attachments.



Transfer of the recorded relationship to the articulator:

1. Set the articular condylar at "FB" position
2. Position the transfer base assembly and the cast support to the lower member of the articulator
3. Insert the vertical rod of the transfer assembly into the transfer base and lower it until the bottom of the vertical rod contacts the transfer base. Raise the face-bow fork support until it touches the under-surface of the face-bow fork.
4. Close the upper member of the articulator to be in contact with the support bar and close the centric lock.
5. 3 index grooves should be placed at the base of the cast. Seat the maxillary cast into the bite fork registration.
6. Close the articulator and check clearance for mounting plaster (modify the cast as needed).
7. Mount with mounting stone(low expansion).

In this Simulation lab course, we will use the manikin head as our patient. Please follow the same instruction of the fixed course to relate the facebow assembly to your manikin head.

STEP B Orientation of the mandibular cast to the maxillary cast at the patient's centric jaw relation(CJR) or Maximum intercuspation position(MIP)

All removable partial prosthodontic cases need not to be mounted in centric jaw relation.

In principle, three widely separated tripod points of occlusal contact are necessary to relate the two casts accurately. These contact points may be tooth-to-tooth or tooth-to-

interocclusal recording material. A stable orientation of the opposing casts may exist if sufficient teeth remain, and in these patients no interocclusal relation recording is necessary. Distal extension cases require record bases to provide these tripod points.

CJR

Removable complete denture opposing removable partial denture

Unilateral or bilateral distal extensions (Kennedy Class I and II)

Extensive fixed and removable combination cases requires rehabilitation (Multiple surveyed crowns, or vertical dimension to be changed)

MIP

Most Kennedy Class III and Class IV cases

Short distal extensions with stable occlusal contacts of the remaining teeth

Flowable inter-occlusal recording medium used to register the relationship of the opposing dentition/ wax occlusal rim

1. The record bases with occlusal rims need to be tried, fitted and adjusted to the available interarch space. They should be tried in the patient's mouth one arch at a time. Over-extended borders and irregularities on tissue surface should be adjusted to assure the intimate fit of the record bases. The record base with occlusal rim should not alter the existing occlusal contacts. Articulating paper can be used to verify the existing occlusal contacts and to identify the premature contact.

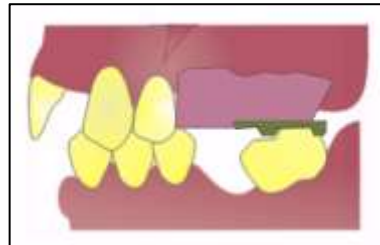
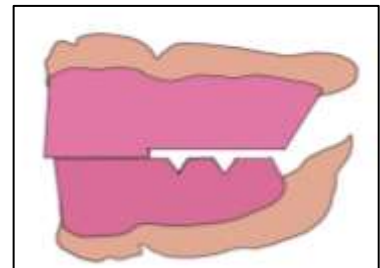
2. Once the patient is able to bring the maxillary and mandibular dentition (with record bases and occlusal rims) in contact without shifting of the jaw, a 2mm recess space should be prepared on the section that opposes teeth or V-shaped notches to provide the clearance for registration medium.

3. 2 layers of softened Aluwax added to the recess area, and a heated wax spatula is used to keep Aluwax in a "dead soft" consistency. This will allow 20-30 seconds to insert the record base and wax rim in the patient's mouth and guide the patient to the desired position, (CJR or MIP).

STEP C. Verification of these relationships by means of confirming repeatable centric relation positions and comparison of occlusal contacts on the articulator with those in the mouth

After the wax is completely hardened, excess wax is trimmed away from the registration area with a sharp knife. The centric relation record should be verified for its repeatability by re-insert these record bases and repeat the jaw relation movements to see if the wax record coincide with the grooves.

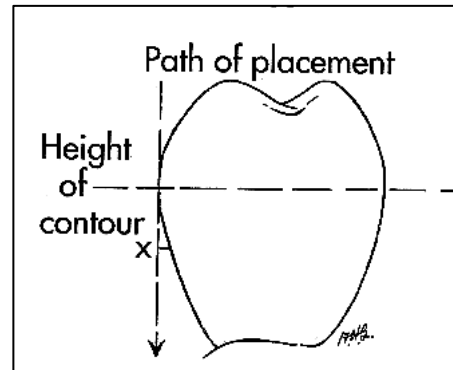
PRIOR TO MOUNTING, THE MANDIBULAR CAST SHOULD BE SECURELY ATTACHED TO THE MAXILLARY CAST USING STICKY WAX AND TONGUE BLADES. PLEASE FOLLOW THE SAME PROCEDURES IN THE FIXED COURSE.



Surveying

Partially edentulous arches consist of teeth and edentulous space. The dental arches also present complicating factors need to be analyzed. The analysis of diagnostic casts on dental surveyor should be the last but not the least step before the treatment plan finalized. After the definitive examination, these questions in the following areas should be answered:

- a. Caries control-
Are caries control process or any replacement of restoration necessary?
- b. Periodontal support-
Are the remaining teeth strong and healthy enough to support the prosthesis?
Is there any need to splint the abutment teeth?
- c. Mucosal support-
Are there any pathological changes related to the previous prosthesis?
- d. Hard tissue abnormalities-
Is there a need referral of pre-prosthetic surgery?
- e. Occlusal analysis-
Is there adequate interarch space for the prosthetic rehabilitation?
Is the proposed abutment tipped or malposed?
Are the proposed rest seats interfere with the occlusion?



The area that provides retention and stability on an abutment tooth usually is determined by a **dental surveyor**. When the cast is placed on the adjustable table and a particular tilt is determined, the analyzing rod that connects to the vertical spindle of the surveyor indicates the proposed **path of insertion**. The line that connects all the contacts between the analyzing rod and the most convex portion of the abutment tooth (**height of contour**) is called the survey line. A triangle is formed between the rod and the surface of the abutment tooth. The apical angle of this triangle is called the **angle of convergence**. The area that lies below the height of contour is referred as the **undercut**. The path of insertion determines the position of height of contour, the size of angle of convergence, and the available undercut area for retention.

These areas are directly related to the quality of retention, support, and stability of the proposed removable partial prosthodontic treatment. The surveying process requires a clear understanding of these clinical limitations/ possibilities to achieve the optimal design.

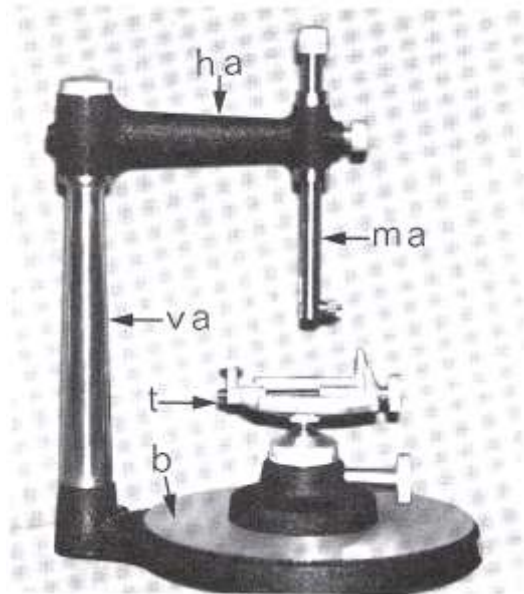


Fig. 4-1 Dental surveyor and surveying table. (b) Base; (va) vertical arm; (ha) horizontal arm; (ma) mandrel; (t) surveying table.

Purpose

- A. Determining most acceptable path of placement and removal
- B. Identify proximal tooth surfaces that may serve as guide planes
- C. Delineate height of contour on the abutment teeth and locate undesirable contour for intraoral modification
- D. Locate and measure undercut areas of teeth that maybe used for retention
- E. Evaluate tissue undercuts that would act as an interference
- F. Record the cast positioning relation to a the path of insertion for future reference

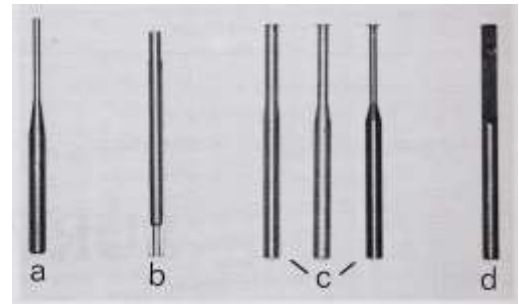


Fig. 4-3 Surveying accessories. (a) Analyzing rod; (b) carbon marker; (c) undercut gauges; (d) wax cutting instrument.

THE PROCESS OF SURVEYING

Step I --Identifying classification, available abutments and the limiting factors-

Radiographic record, mounted diagnostic casts, the charting of clinical intraoral examination, clinical photograph should be available to determine the condition of the abutments.

Step II--Identify the most favorable tilt

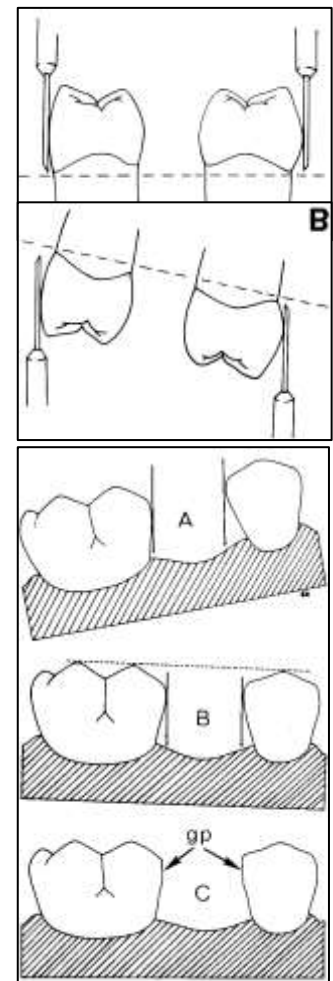
The design cast was position and affixed to the surveying table. The tilts are describe as: anterior- posterior tilt and the left and right tilt.

Extreme tilt needs to be avoided,

4 factors should be considered when determining the most favorable tilt

1. the presence of suitable undercut-
 - a. the retentive undercut should be present on the abutment teeth or be created intraorally
 - b. the angle of convergence should be equivalent on two opposing proximal surface
 - c. the most favorable tilt should be perpendicular to the occlusal plane under normal circumstances
 - d. if the cast needs to be tilted in order to locate the undercut, AP tilt is more favorable than the LR tilt, and the tilt should stay within 15 degree of the normal orientation

2. the elimination of hard and soft tissue interference
Exostoses, undercuts and facial tipping of the abutment he could create problem for the infrabulge type bar clasps. Tilt the cast could reduce the difficulties in eliminating the interference
3. the creation of desirable esthetics-

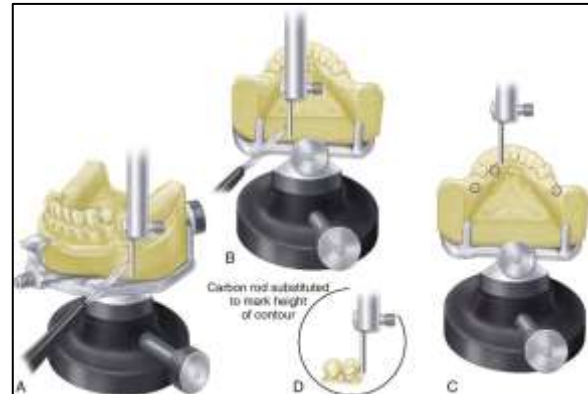


- the metal component should be concealed effectively, the prosthetic teeth should be properly selected, contoured and positioned
4. the establishment of ideal guiding plane
Guiding planes are parallel surfaces of abutment teeth that directs the insertion and removal of a prosthesis

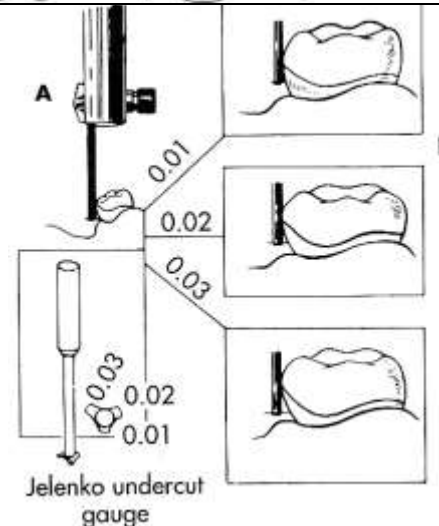
Step III--- Delineation of the height o contour and tripodging the cast

After the most favorable tilt has been determined, the particular orientation needs to be recorded for future reference. Three widely spaced marks or 3 lines on the side of the casts are marked with **BLUE** pencil on the cast while the vertical arm of the surveyor is held at a fixed vertical position.

Survey lines are marked with carbon marker attached to the vertical arm. The surveying table is then move along the platform to allow light contact of the marker and the cast. Survey lines are transferred to the abutment teeth and soft tissue by moving the surveying table across the platform.



Step IV--Locating and marking the measured undercut
Undercut gauge are used to mark the ideal position of undercut. The depth and position of desire undercut will vary with the clasp system and the retentive requirement based on the form, cross section, and the material. Upon selection and insertion of the appropriate undercut gauge, the table is then positioned to allow the cast lightly contacts the vertical shank of the gauge. The vertical arm is moved until the flange of the undercut gauge lightly contact the infrabulge area. The point of contact is then mark with a **BLUE** pencil.



Step V continue the design process

The cast is then removed from the table. The following component/preparation are marked with different color pencils.

RED--Rest seat and guiding plane preparation; outline the direct and indirect retainers, minor and major connectors

BLACK--used to outline the rest seat and write the indicated specs for a particular retainer or denture tooth replacement, eg. WW, 0.02", TT, or SC.

BLUE-- marking the retentive undercut, areas that requires re-contouring, outline of the extension of the denture base and the tripod markings.

The surveyed, clearly drawn design cast and well-recorded design worksheet are absolutely required for ALL RPD CASSES. These steps of surveying should be checked and approved by faculty member before continue the design process.

RPD Kennedy Classification

Class I	Bilateral edentulous areas located posterior to the natural teeth
Class II	A unilateral edentulous area located posterior to the remaining natural teeth
Class III	A unilateral edentulous area with natural teeth remaining both anterior and posterior to it
Class IV	A single, but bilateral (crossing the midline), edentulous area located anterior to the remaining natural teeth

Obviously, class I and II RPDs involves more soft tissue coverage. Careful distribution of occlusal force between the distal extensions and abutment teeth becomes the major issue of Class I and II RPD.

Each Kennedy classification, except Class I, refers to a single edentulous area. In reality, additional areas of edentulism may occur within a dental arch. Kennedy referred to each additional edentulous area—not each additional missing tooth—as a modification space. Dr Kennedy included the number of modification areas in the classification (eg, Class I, Modification 1; Class II, Modification 3).

Applegate's rules for classification

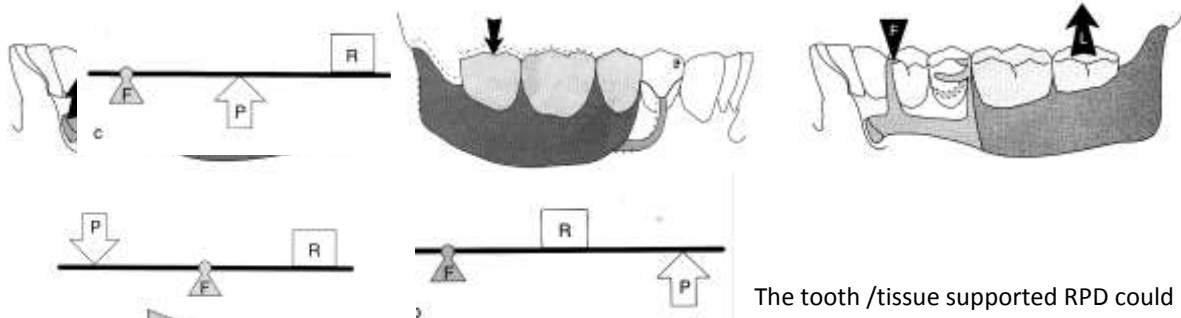
While the Kennedy system provided a method for classification of partially edentulous arches, there was some uncertainty regarding its application. In 1954, Dr O. C. Applegate provided the following rules to govern application of the Kennedy system:

1. Classification should follow rather than precede extractions that might alter the original classification. If extractions are to be performed, classification should follow rather than precede the extractions.
2. If the third molar is missing and not to be replaced, it is not considered in the classification.
3. If a third molar is present and is to be used as an abutment, it is considered in the classification.
4. If a second molar is missing and is not to be replaced (that is, the opposing second molar is also missing and is not to be replaced), it is not considered in the classification.
5. The most posterior edentulous area(s) always determines the classification.
6. Edentulous areas other than those determining the classification are referred to as modification spaces and are designated by their number.
7. The extent of the modification is not considered, only the number of additional edentulous areas.
8. There can be no modification areas in Class IV arches. Any edentulous area lying posterior to the single bilateral area determines the classification.

Mechanical Principles related to RPD

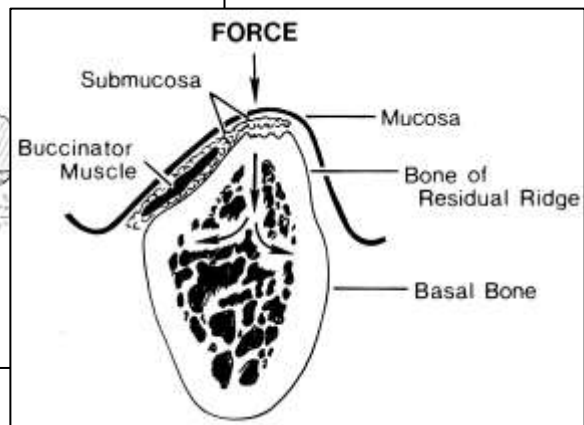
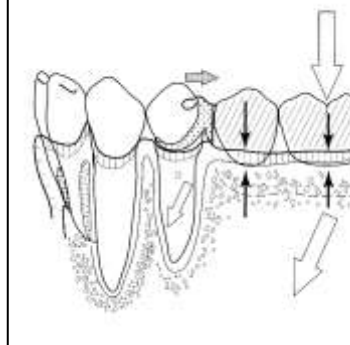
I. The analysis of force, lever and rotation

The simplest form of a lever is a rigid bar supported somewhere along its length. The support point is called the fulcrum. The lever can move around the fulcrum. There are 3 types of lever system. Classification is based on location of fulcrum, resistance and direction of effort.



The tooth /tissue supported RPD could rotate in relation to the three cranial planes because of differences in the support characteristics of the abutment teeth and the soft tissue covering the edentulous area. Even the gross movement may be small, the potential exists for a detrimental, lever-like forces to be imposed to the abutment teeth. A cantilever is a beam supported only at one end and can act as a first class lever. The possible movements of a partial denture:

- Rotation about an axis through the most posterior abutment
- Rotation about longitudinal axis as the distal extension base moves in a rotational direction
- Rotation about an imaginary vertical axis located near the center of the dental arch

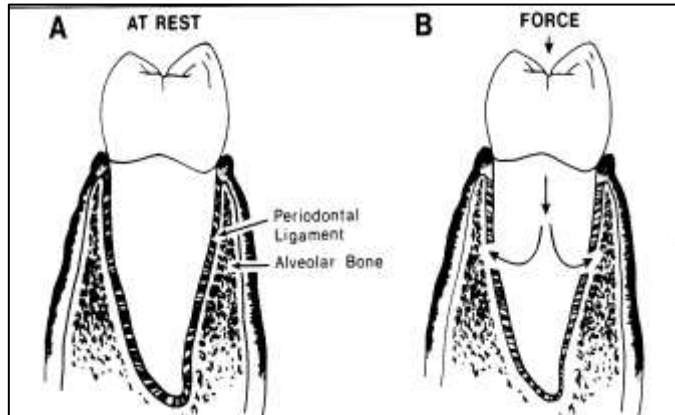


In a tooth-supported RPD, movement of the base is minimized by the rests on the abutment teeth. A distal abutment tooth for a Kennedy class I and II arch is better able to tolerate vertically directed forces than off-vertical torquing, or near horizontal forces. The evidence base of this theory is based on the more PDL fibers are activated to resist the application of vertical forces to teeth.

II. The analysis of RPD components-this portion will be discussed in later section

III The analysis of the supporting tissue

The supporting tissue response to the off-vertical forces is directly related to the prognosis of the RPD treatment. A normal periodontium permits some force damping without damaging effect. Excessive force may increase the PDL width and result in increased tooth mobility. Poor periodontal prognosis of the abutment teeth will result in much faster breakdown of the retention / support / stability maintained by the abutment. For the soft tissue covered edentulous ridge, if the force is not well distributed to a broad supported area, localized inflammation (denture sore) and subsequent bone remodeling might occur.

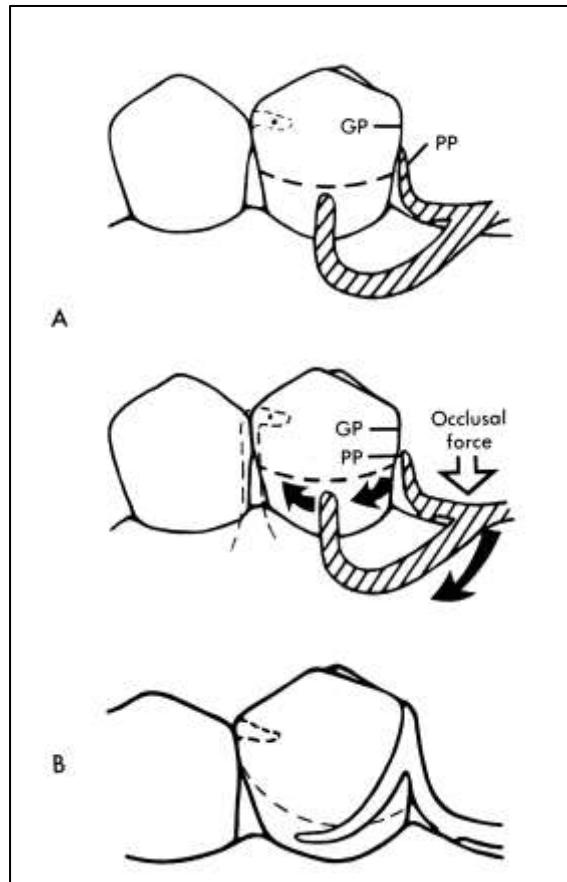


A distal extension RPD rotates when the occlusal forces are applied to the artificial teeth attached to the extension base. The rotation creates predominantly off-vertical forces, location of stabilizing and retentive component in relation to the horizontal axis of rotation of the abutment becomes extremely important. An abutment tooth will better tolerate off-vertical forces if these forces accrue as near as possible to the horizontal axis of rotation of the abutment.

The force occurring through a removable prosthesis can be widely distributed, directed and minimized by the selection, the design, and the location of components of the RPD and by development of harmonious occlusion.

When mechanical forces exerted on removable partial dentures during functional and para-functional mandibular movements, these forces should be properly directed to the supporting tissue to elicit the most favorable response. The location and the configurations of the edentulous span could affect the design and the technique of fabrication. Therefore, a classification system of partial edentulism helps simplifying the problems, improving communication and the understanding the case among the dental professionals. An acceptable method of classification should be:

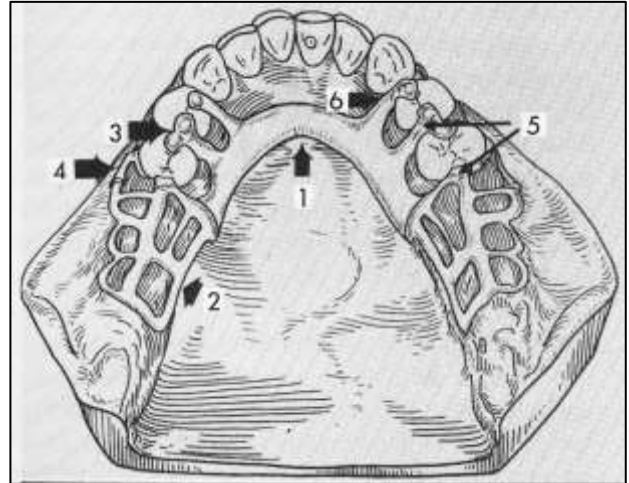
- (1) it should permit immediate visualization of partially edentulous arch.
- (2) It should permit clear differentiation between the tooth-supported and the tooth/ tissue supported removable partial denture
- (3) It should be universally accepted



COMPONENTS OF A REMOVABLE PARTIAL DENTURE

Every RPD will have all of the following components:

1. Major Connector
2. Minor connectors
3. Rests
4. Direct retainers (retentive clasp arms)
5. Reciprocal and stabilizing component of a clasp assembly
6. Indirect retainers (if the prosthesis has one or more distal extension)
7. Denture base(s)



RPD Direct retainers

Primary retention of a removable partial denture is accomplished by placing the retaining component on the abutments.

Secondary retention is accomplished by intimate contacts of the denture bases, major connectors, and minor connectors with the underlying tissue.

Definition of direct retainers are the components of RPD that engage the abutment tooth in such a manner as to resist displacement of the partial denture **away from** the basal seat tissue. This could be achieved by the friction means or engaging a depression in the abutment or by engaging a tooth undercut lying cervically to the height of contour.

Extracoronary Direct Retainers

Suprabulge retentive clasp

The retentive arm approaches the retentive undercut from the occlusal direction- above the height of contour

1. Circumferential Clasp
2. Embrasure Clasp
3. Reverse action (hair pin) clasp
4. Ring clasp
5. Combination clasp-wrought wire

Infrabulge Retentive clasp

The bar-type clasp arm approaches the retentive undercuts from the gingival direction-below the height of contour

1. I-Bar
2. T-Bar
3. Modified T-Bar
4. Y-Bar

Function and position of a suprabulge circumferential clasp assembly

A. Rest—Supporting unit

- a. Occlusal
- b. Lingual
- c. Incisal

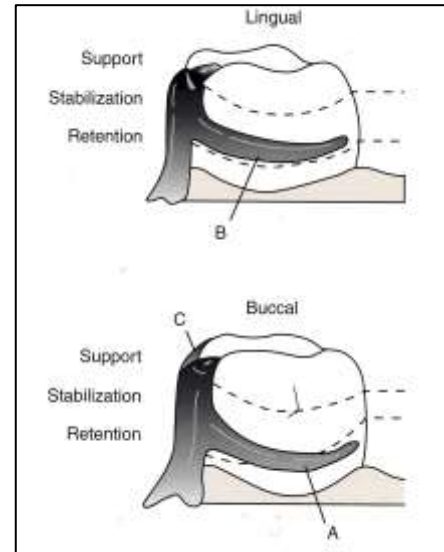
B.Minor connector—Stabilization unit

Proximal guide plate contacting the proximal surfaces extending from a prepared marginal ridge to the junction of the middle and gingival 1/3 of the abutment crown.

C.Retentive Clasp arm-

- a. The retentive unit - terminal 1/3 of retentive clasp arm engaging gingival 1/3 of crown in 0.01" undercut.
- b. The stabilization (reciprocation) unit -The proximal 2/3 of retentive clasp located in the middle 1/3 of crown

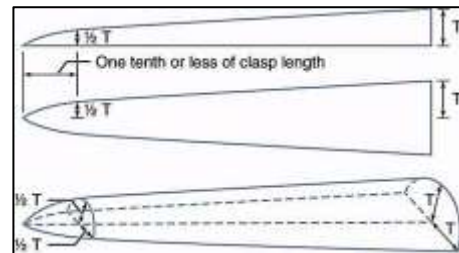
D. Reciprocal(Bracing) clasp arm- the stabilization unit Located in the middle 1/3 of clinical crown



The retentive clasp arm

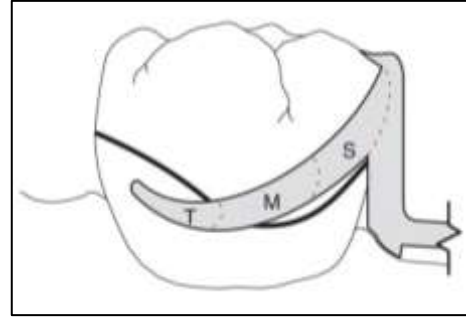
The following factors determines the amount of retention provided by a clasps

- A. Size of the angle of convergence
- B. Location of a clasp terminates in the angle of convergence
- C. Flexibility of the clasps
 - a. Length-the longer the clasp arm, the more flexible it is
 - b. Relative diameter-
 - c. Cross-sectional form-
 - i. the half round form-Most cast clasps are half round. Flexibility may exist, but it is limited to only one direction.
 - ii. the round form- the only universally flexible form. Safest circumferential clasp to use for a distal abutment on Kennedy class I or II

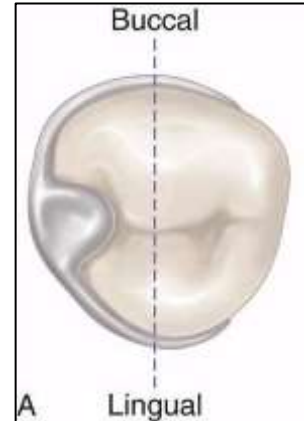


d. Material used

- i. Cast metal- most cast metal clasp needs 0.01" undercut
- ii. Wrought wire-thinner gauge wrought wire clasps need 0.02" undercut, the wrought wire we are using in NSU pre-Doc program is 20 gauge wire, 0.01" undercut is acceptable



A clasp has two parts- usually the proximal 2/3 is rigid in order to maintain the structure durability and the terminal 1/3 is flexible. The resistance of the metal clasp to deformation generates retention. Only the flexible portion of a clasp arm should be placed below the height of contour. The rigid portion should always be placed above the height of contour. In some cases, modification of the tooth surface is required to alter the height of contour. By changing the location of height of contour, a clasp could be more effectively engaging the proper undercut. The most suitable path of insertion generally requires the least amount of intraoral modification of the height of contour. A retentive arm is always tapered. The rigid 2/3 is thicker, the flexible 1/3 is the thinner.

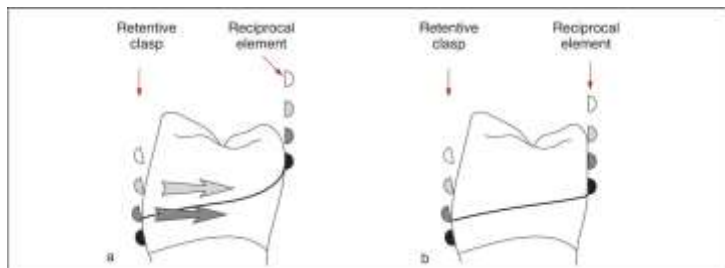


The length of a cast circumferential arm must be at least 6 mm from its origin to its termination.

Reciprocal clasp arm

1. A reciprocal clasp arm should be rigid.
2. The reciprocal arm should be shaped differently than the cast retentive clasp arm
3. The average diameter of the reciprocal clasp should be greater than the retentive arm, and does not tapered in two dimensions
4. The reciprocal arm should always be placed above the height of contour.
5. The reciprocal arm requires to be rigid to provide stabilization against horizontal movement

Reciprocation is the quality of a clasp assembly that counteracts lateral displacement of an abutment when the retentive clasp terminus passes over the height of contour



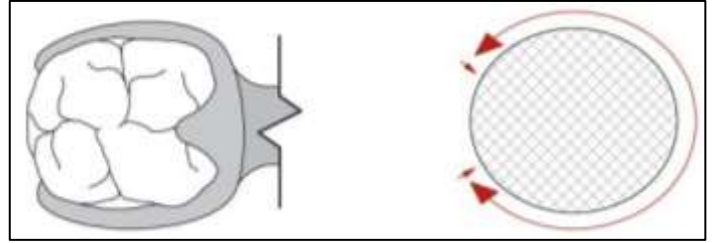
The retentive clasp must flex to pass over the height of contour. This

results in the application of lateral forces to the abutment. To negate these forces, a clasp assembly must include a rigid component that resists lateral movement of the affected tooth. This component is known as a reciprocal element. The reciprocal element may be

- a. a cast clasp arm in the circumferential clasp assembly,
- b. a lingual apron, or
- c. a combination of mesial minor connector and distal guide plate

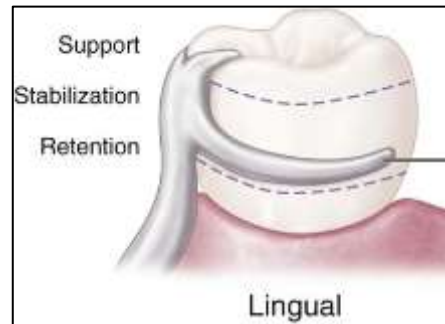
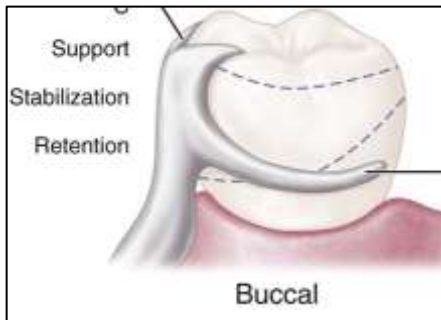
Encirclement of a clasp assembly

Encirclement is the characteristic of a clasp assembly that prevents movement of an abutment away from the associated clasp assembly. Each clasp assembly must be designed to provide direct contact over at least 180 degrees of the tooth's circumference.



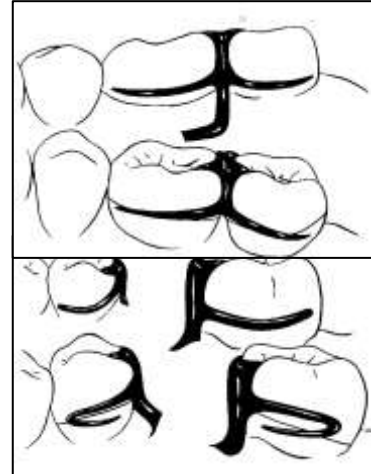
Circumferential clasp

A circumferential clasp "grasps" the tooth like two arms holding a barrel, one arm on the facial surface, one on the lingual. A circumferential clasp arm should ideally be curved only in one plane, the plane that is the "circumference of a barrel". Therefore this arm will be shaped like the letter C. A circumferential arm can either be retentive or bracing.



Embrasure clasp

Combining two single circumferential arms produces an embrasure or "crib" type clasp. The best use for an embrasure clasp is in Class IV posterior abutments situations. Occlusal clearance of rest seats and adequate "channel" preparation are crucial.

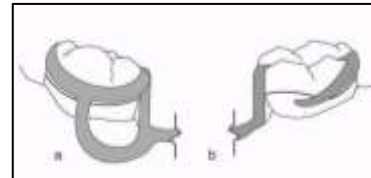


Reverse action (hairpin) clasp

A reverse action arm changes its direction 180 degrees from the area occlusal to the survey line to engage an undercut. A reverse action arm is usually used when the only usable undercut is next to the edentulous area, particularly the mesiobuccal undercut of a tilted molar abutment.

Ring Clasp

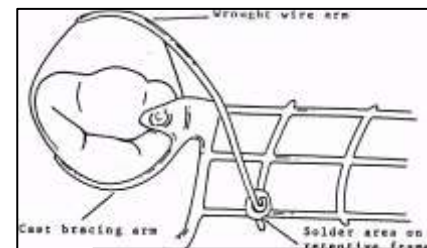
A ring clasp is a complicated device that is designed to engage an undercut that no other design can handle. A mesially inclined molar that is rotated and tilted lingually, presents an undercut on the mesiolingual that only a retentive arm from the distal will engage. This often requires a clasp that originates on the mesial and encircles the tooth almost completely. **A ring clasp requires a distal rest, a mesial rest, and a buccal strut to support the system and to prevent its fracture.** A ring clasp should only rarely be included in the design because it requires so much coverage of the abutment tooth. It complicates the preparation, impression, lab procedures as well as patient's oral hygiene.



Combination clasp

A wrought wire circumferential arm is often brazed (soldered) to the framework in combination with a cast bracing arm. This pairing of different types of metals is termed a combination cast-wrought clasp.

The tang or tail of the wrought wire clasp is brazed (soldered) to the retentive meshwork of the framework, well to the lingual of the crest of the ridge and 1 cm. distal to the guide plate area. This ensures minimal encroachment by the soldered end of the wrought wire clasp on the interocclusal space needed later for setting teeth.



Advantages of the combination clasp include:

1. **flexibility**- It is used when maximum flexibility is desirable, such as on **an abutment tooth adjacent to a distal extension base** or on a weak abutment when a bar-type direct retainer is contraindicated.



2. **adjustability**- It may be used for its adjustability when precise retentive requirements are unpredictable and later adjustment to increase or decrease retention may be necessary.

3. **appearance**-Wrought in structure, it may be used in smaller diameters than a cast clasp, with less danger of fracture. Because it is round, light is reflected in such a manner that the display of metal is less noticeable than with the broader surfaces of a cast clasp.

4. **hygiene**-coverage of a minimum of tooth surface as a result of its line contact with the tooth, rather than having the surface contact a cast clasp arm;

5. **structural durability**- a less likely occurrence of fatigue failure in service with the tapered wrought-wire retentive arm versus the cast, half-round retentive arm.

The disadvantage of combination clasp

(1) it involves extra steps in fabrication, particularly when high-fusing chromium alloys are used;

(2) it may be distorted by careless handling on the part of the patient;

(3) because it is bent by hand, it may be less accurately adapted to the tooth and therefore may provide less stabilization in the suprabulge portion; and

(4) it may distort with function and not engage the tooth.

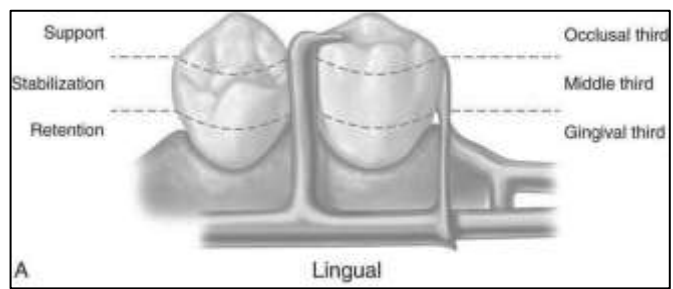
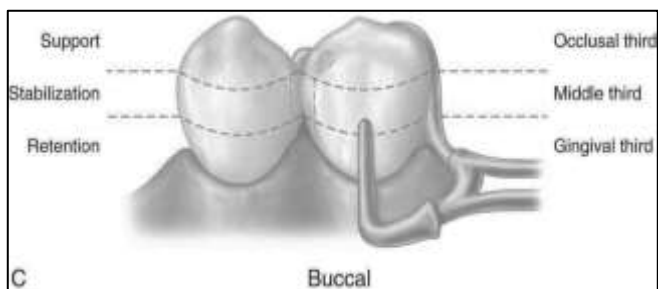
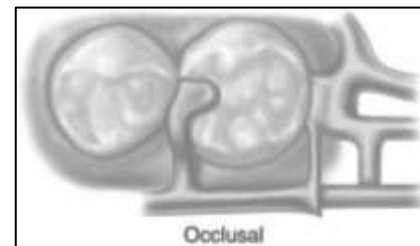
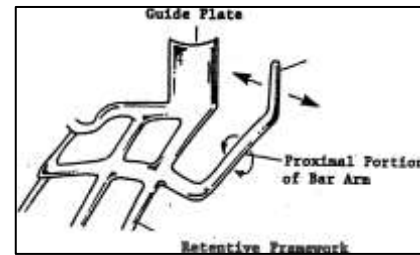
Function and position of a Infrabulge clasp assembly

Bar clasps

The other basic design for a retentive arm is shaped like a rod or bar bent at a right angle. Because of its bar shape this type of arm is termed a bar clasp arm.

A bar arm approaches the undercut from below the survey line and so is defined as an infrabulge clasp arm.

This arm does not usually originate from the guide plate minor connector or rest seat, as does the circumferential arm, but arises from the acrylic resin retentive mesh.



The I-bar may be placed completely gingival to the survey line. It may also be made with an elongated finger projecting to or occlusal to the survey line to facilitate its removal in the path of insertion. An I-bar arm is flexible in two areas along its length. The horizontal portion of the arm rotates around its axis and the vertical member flexes along its length.

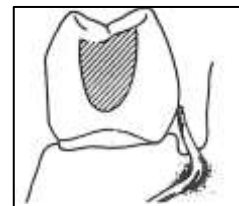
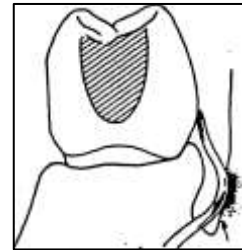
A bar retentive arm must be a minimum of 12 mm. from its origin to termination in order to flex into a 0.01" undercut. Any arm shorter than this will resist flexing and will tend to deform permanently.

Indication of I-Bar

- A. a small degree of undercut exists in the cervical 1/3 of an abutment tooth and could be approached from the gingival direction
- B. Bar arms are most often used in mandibular Class I and II distal extension abutments. They are considered to produce less stress to the abutment teeth than circumferential arms.
- C. They are also used where an undercut is not suitable for use with a circumferential arm.
- D. esthetic concern (Anterior abutment of an Kennedy Class III RPD case)
- E. bar arms have less surface area around which plaque can accumulate and so are thought to be a better design for control of plaque.

Disadvantage of an I-Bar

- 1. If a large soft tissue undercut exists, the bar portion will have a space between it and the gingivae and will produce a food trap area. A bar might also irritate the buccal mucosa.
- 2. Shallow vestibule or high frenum attachment can irritate mucosa
- 3. Increased flexibility of the retentive arm does not contribute a great deal to the horizontal stability of the prosthesis. Hence, additional bracing and stabilizing units may be required when an infrabulge clasp is used.
- 4. Severely lingually tilted teeth are contraindicated for I-Bars.
- 5. Abutment with existing large class V restorations or cervical abrasions might not be suitable for retentive undercut area.

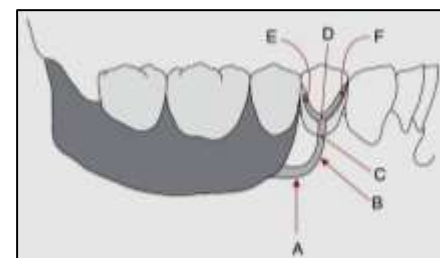
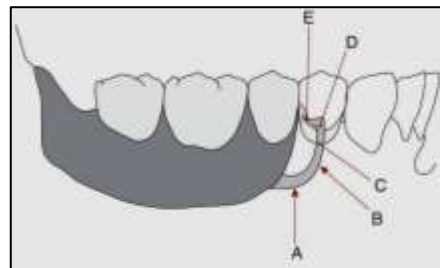
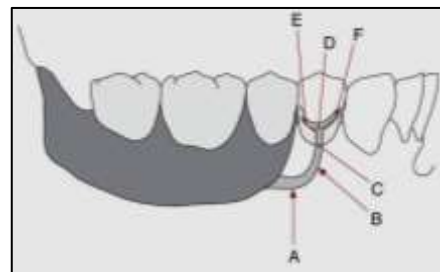


There are variations of the bar type arm just as there are variations of the circumferential clasp design. Letters corresponding to the shape of arm usually designates the variations. For example, a T bar is shaped like the letter T.

If any of the letter varieties are used (T, modified- T, Y), the end of the vertical portion of the arm must be located above the survey line and the horizontal member should have flexibility similar to the distal 1/3 of the retentive arm of the circumferential clasps.

A modified-T type of arm is the most common of these shapes and is used when an undercut exists nearest the edentulous area on premolars.

Most other "letter" designs have limited use. The application of other, simpler, designs most often produces better results and should be considered before complicated retentive arm designs are used.



Requirements of a clasp assembly

All clasp assemblies must be designed so that they satisfy the following six requirements:
(1) retention, (2) support, (3) stability, (4) reciprocation, (5) encirclement, and (6) passivity.

Retention

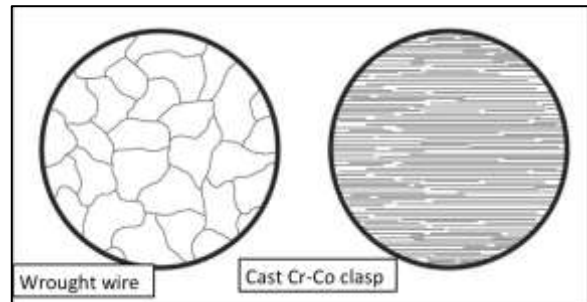
Retention is the quality of the clasp assembly that resists forces acting to dislodge components away from the supporting tissues.

1. The retentive arm must be designed so that only the clasp terminus engages the prescribed undercut.
2. The accompanying rest must provide support so the clasp terminus is maintained in an optimal location.
3. The minor connector must be sufficiently rigid to ensure proper stability and function of parts of the clasp assembly.
4. The reciprocal element must contact the abutment slightly before the retentive element contacts the tooth, and it must maintain contact until the prosthesis is fully seated to protect the abutment from potentially destructive lateral forces.
5. Components must provide sufficient encirclement to prevent movement of the abutment away from the associated clasp assembly, otherwise retention will be lost.
6. Indirect retainers must resist forces acting to dislodge the prosthesis from its fully seated position (these forces may result from the actions of sticky foods, gravity, etc).

As a general rule, the amount of retention designed into a removable partial denture should always be the minimum necessary to resist reasonable dislodging forces. Particularly distal extension RPDs.

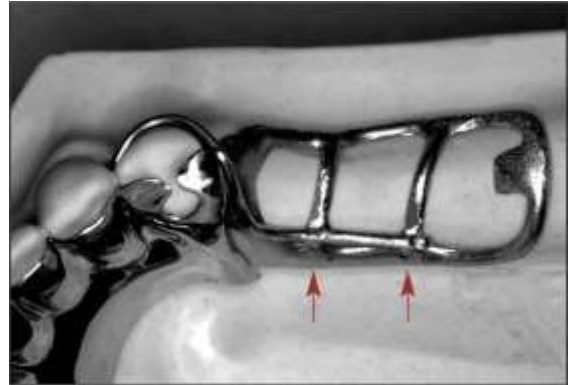
The retention of wrought wire clasps

1. When designing the clasp system for distal abutments of a distal extension RPDs, 1st choice is infrabulge clasps, RPI system would provide least amount of dislodging force. Your second choice is using wrought wire clasps.



2. The metallurgical properties of an alloy influence clasp flexibility. Alloys exhibiting higher elastic moduli exhibit greater stiffness, while alloys displaying lower elastic moduli exhibit greater flexibility.

Cobalt-chromium and nickel-chromium alloys have higher elastic moduli, clasps made from chromium-containing alloys are more rigid. Wrought wire is produced by drawing a cast metal through a die. This process produces elongation of the alloy's crystalline, and create greater flexibility than a conventional crystalline structure.



3. To maintain its flexibility, a wrought-wire clasp should be soldered to the minor connector (mesh or lattice) of metal frameworks. Solder joints should be located at least one tooth away from proximal plates.

Support

Support is the quality of a clasp assembly that resists displacement of a prosthesis in an apical direction. The removable partial denture component that provides the greatest resistance to apical displacement is the rest.

A properly prepared rest seat and corresponding rest serve to

- (1) resist displacement of the prosthesis toward the supporting teeth and soft tissues, thereby ensuring that the clasp assembly maintains its intended relation to the abutment, and
- (2) transmit functional forces parallel to the long axes of the abutments. These factors are critical to the health and longevity of abutments.

Stability

Stability is the quality of a clasp assembly that resists displacement of a prosthesis in a horizontal direction.

All framework components that are rigid and contact vertically oriented hard and soft tissues may contribute to the stability of a prosthesis. Within an individual clasp assembly, stability comes from

- a. the reciprocal element,
- b. the shoulder(s) of a cast circumferential retentive clasp, and
- c. vertically oriented minor connectors.

Reciprocation

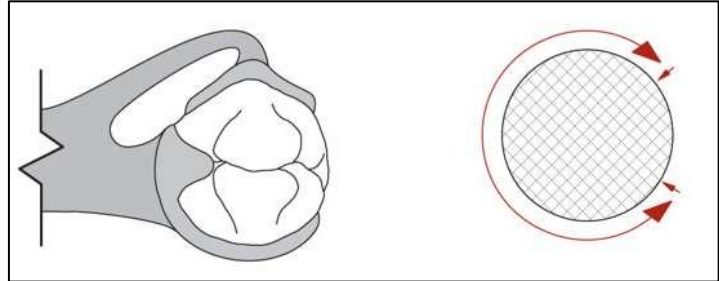
Reciprocation is the quality of a clasp assembly that counteracts lateral displacement of an abutment when the retentive clasp terminus passes over the height of contour. Lateral displacement of an abutment is potentially harmful to the supporting periodontal tissues. Therefore, lateral forces must be offset by components of the clasp assembly. . The reciprocal element may be

- a. a cast clasp arm in the circumferential clasp assembly,
- b. a lingual apron, or

c. a combination of mesial minor connector and distal guide plate

Encirclement

Encirclement is the characteristic of a clasp assembly that prevents movement of an abutment away from the associated clasp assembly. Each clasp assembly must be designed to provide direct contact over at least 180 degrees of the tooth's circumference. This contact provides encirclement and prevents movement of the abutment away from the clasp assembly.



Encirclement may be provided in the form of **continuous contact**, as demonstrated by circumferential clasp assemblies. Encirclement also may be provided by **discontinuous contact**, as evidenced by infrabulge clasp assemblies. If discontinuous encirclement is planned, the clasp assembly must contact the abutment tooth at **three widely separated areas** that encompass more than half the tooth's circumference.

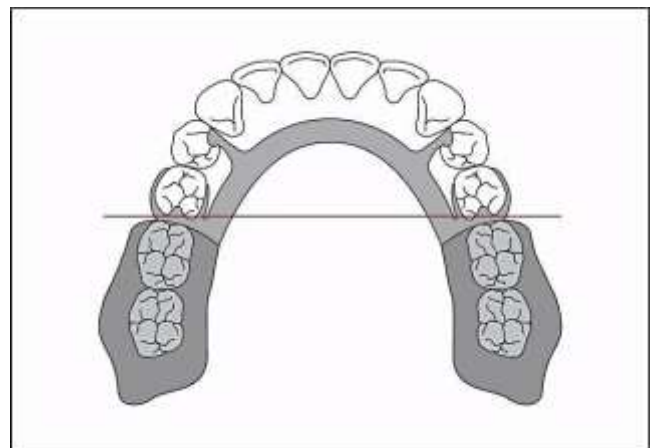
Passivity

Passivity is the quality of a clasp assembly that prevents the transmission of adverse forces to the associated abutment when the prosthesis is completely seated. When fully seated, a clasp assembly should be passive. The retentive arm should be activated only when dislodging forces are applied to the removable partial denture.

Indirect Retainers

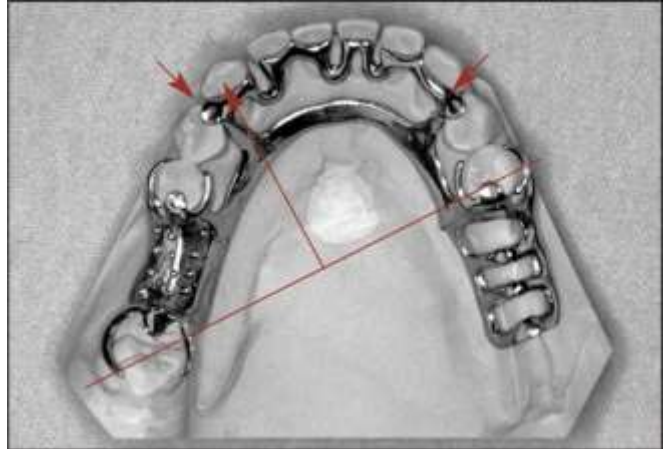
A removable partial denture derives support from

- 1). periodontally sound natural teeth through properly constructed rests contacting well-prepared rest seats.
- 2). edentulous regions, the residual alveolar processes and associated soft tissues may provide support for well-adapted denture bases.



When an occlusal load is applied to a distal extension removable partial denture, the prosthesis rotates around a **fulcrum line** that passes through the most posterior rests—one on each side of the dental arch.

Sticky foods or other substances may pull on the artificial teeth and move the extension base **away from** the underlying ridges. The RPD design must provide one or more components to limit such movement. These components usually are placed as far anterior, and as perpendicular, to the fulcrum line as possible. These components could be occlusal, cingulum, or incisal rests.



Some Designing Principles

The following rules apply to **cast circumferential clasp design**:

1. Every tooth adjacent to an edentulous area must have a rest (or at least a lingual apron), this rest should be as close to the edentulous area as possible
2. In some selected cases, lingual retentive arms and buccal reciprocal arm can be used.
3. A cast circumferential clasp should originate from a portion of the framework that lies above the height of contour. The retentive arm should extend cervically and circumferentially in a gently arcing manner. The terminal third of the retentive clasp should pass over the height of contour and enter the infrabulge portion of the abutment. It is important to note that only the apical border of the retentive clasp terminus should engage the desired undercut. The reciprocal element should be located at or slightly above the height of contour on the opposite surface of the tooth and should prevent lateral displacement of the abutment when the retentive clasp flexes over the height of contour.
4. The retentive terminus should be directed occlusally, never toward the gingiva. The long, curved clasp arm that results from this contour permits improved flexibility
5. A cast circumferential clasp arm should terminate at the mesial line angle or distal line angle of the abutment, never at the midfacial or midlingual surfaces.
6. The retentive arm should be positioned as far apically on the abutment as is practical. The clasp arm should never violate the prescribed relationship to the height of contour or impinge upon the free gingival margin. (at least 2 mm away)
7. When designing the metal framework for an extension base removable partial denture, a cast circumferential clasp should not be used to engage (a) the mesiofacial surface of an abutment adjacent to a posterior edentulous space or (b) the distofacial surface of an abutment adjacent to an extensive anterior edentulous space. The biomechanical difficulties produced by such arrangements often lead to premature loss of abutments.

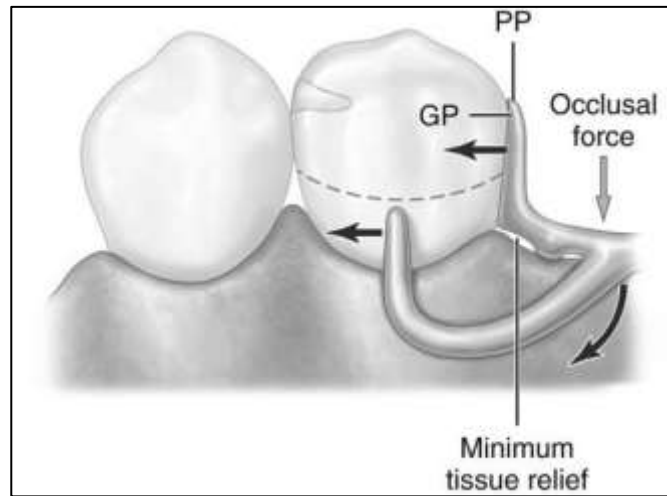
The following design rules are applicable to **infrabulge clasps**:

1. The approach arm of an infrabulge clasp must not impinge on the soft tissues adjacent to the abutment. It is not desirable to provide relief under the approach arm, but the tissue surface of the approach arm should be smooth and well polished.
2. The approach arm should cross perpendicular to the free gingival margin. The sensitive periodontal tissues must be protected from irritation by inducing as little interference with normal function and contour as possible.
3. The approach arm should never be designed to "bridge" an area of soft tissue undercut since this will produce an increased risk of food entrapment and may result in irritation of the associated soft tissues.
4. To optimize flexibility, the approach arm should be uniformly tapered from its origin to the clasp terminus.
5. The clasp terminus should be positioned as far apically on the abutment as is practical. Proper placement of the clasp terminus yields a decrease in leverage-induced stresses resulting from movement of the prosthesis.
6. The minor connector that attaches the occlusal rest to the framework should be rigid and should contribute to the overall bracing and stabilization characteristics of the prosthesis.

The proximal guide plate and guide plane preparation

OVERVIEW

As part of the clasp assembly, a proximal guide plate is considered as a minor connector, which joins elements of a clasp assembly to other components of a removable partial denture. Guiding plates, as part of the stabilizing components, will direct insertion and removal of the removable partial denture and also provide a reciprocation to counteract non-axial forces produced by a retentive clasp.



GUIDE PLANE PREPARATION

Guide planes created on the abutment teeth determine the path of placement for the partial denture framework. The creation of these guide planes on natural tooth structure or on existing restorations is subject to the following criteria:

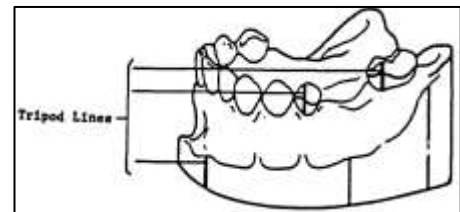
1. The tooth structure or restoration to be modified must be sound and must have sufficient bulk.
2. The inclination of the tooth must be advantageous for modification. (For example, the guide plane must not "ledge" the tooth near the gingival third.)
3. The diagnostic casts may be altered before mouth preparation by creating the guide planes in stone. This diagnostic modification will reveal how much tooth structure is to be removed and where it is to be removed. It will also serve as a guide when the modifications are performed on the patient's dentition.

The alterations of the cast may be done with a wax knife, Bard-Parker- knife, or slow speed rotary instrument. The result of this modification should be checked with the analyzing rod on the surveyor.

Armamentarium

The armamentarium necessary for the creation of guide planes in enamel or an existing restoration is:

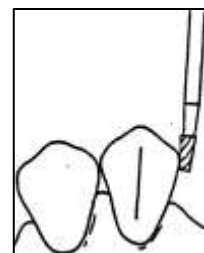
1. #7205 and 7675 carbide burs.
2. Moore's contra-angle mandrel and disks (sand, carborundum, and cuttle)
3. Prophylaxis cup, pumice and topical fluoride



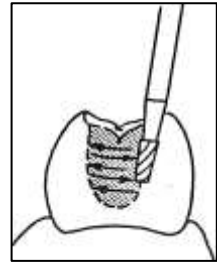
All guide planes in an arch are parallel to the path of insertion and to each other and will determine the path of insertion of the denture.

Tripoded design cast should be present during the clinical visit. It will help to visualize the relationship of the bur to the surface of the tooth planned for a guide plane. These tripod lines are, after all, visualization of the path of insertion.

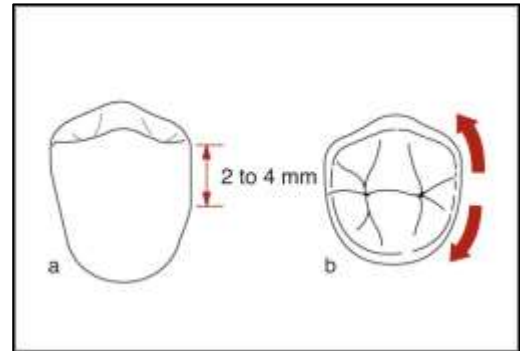
A pencil line approximating the tripod lines on the stone teeth is marked on the enamel of the abutment tooth to be used as a reference line for bur placement.



A guide plane must never "ledge" a tooth near the gingival third. This area would collect plaque and probably become sensitive. If the path of insertion cannot be modified to prevent this ledge, then the guide plane must be omitted or a cast restoration to control the contours of the tooth should be considered.

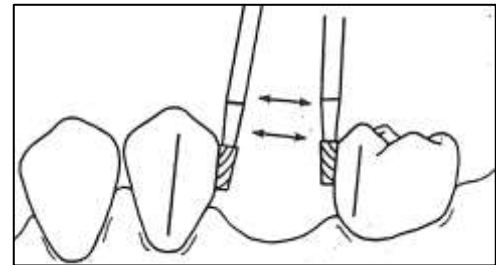


A # 7205 carbide bur is lined up with the tripod reference line to begin the creation of guide planes. The desired bur or stone, usually the 7205 or 7675 carbide, is placed at the planned angle on the proximal surface to be modified. It is then moved in an arc bucco-lingually to insure a curved surface. The tooth structure is carefully removed until about 2/3 the width and 2/3 the height of the surface (2-4 mm) are parallel to the desired path of insertion.



The other areas to be modified for guide planes are reduced in the same manner using the first guide plane as a reference.

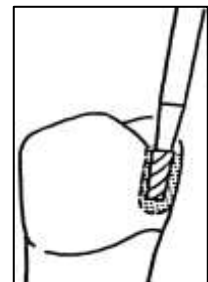
Constant rechecking of parallelism will avoid the removal of too much tooth structure. Even with this constant checking, one or more of the newly created surfaces will often be undercut to the path of placement. The final corrections must be done carefully, using only a fine diamond or sandpaper disk.



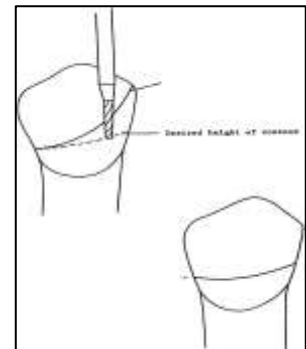
After all the guide plane surfaces have been deemed parallel, the line angles that are formed buccally and lingually by the initial cut are rounded by blending them into the buccal and lingual surfaces with the same #7205 carbide bur or a fine diamond stone.

Changing the Height of contour

At the same time that the guide planes are being created, any alteration of the height of contour to allow for more favorable bracing surfaces or more favorable retentive arm placement is also done. Altering the height of contour more gingivally is accomplished by keeping the bur angled in the same path of insertion as the guide planes and sweeping the bur gently until the desired level is reached.



After bulk reduction is finished, the guide planes and any other modified surfaces are smoothed using a fine carborundum or sandpaper disk. The smoothed surfaces are then polished with cuttle disks and pumice, and the tooth is treated with topical fluoride. The smoothing must be done with great care, for over-reduction often causes divergence of the guide planes.

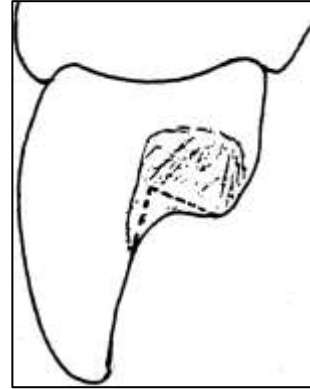


Summary

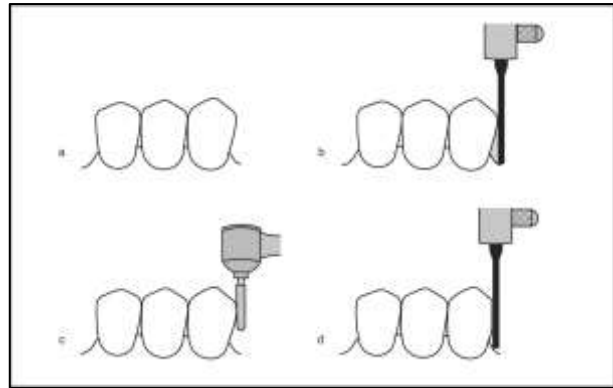
Carefully planning the angle of the bur to the tooth, practicing the reduction on studycasts, and then, if necessary, checking the result on a surveyor with a cast poured in fast setting plaster or mounting stone in an alginate impression will reduce errors and produce a better restoration.

Proximal Guide Planes on Anterior Teeth

It is highly desirable to prepare guide planes on proximal surfaces of anterior abutment teeth. Like guide planes on posterior teeth, they function to help direct a single path of insertion and withdrawal of the prosthesis, they aid in stabilizing it and add frictional retentive force. The location and proportions of the prepared guide plane surface differ markedly, however, from proximal guide planes on posterior teeth receiving occlusal rests. On a posterior tooth, the proximal surface adjacent to an edentulous space is prepared in the area apical to the prospective occlusal rest seat. The dimensions of the preparation are about $\frac{2}{3}$ the width and $\frac{2}{3}$ the height of the proximal surface, more-or-less in the bucco-lingual center of the tooth. and following the bucco-lingual curvature of the proximal surface.



On an anterior abutment tooth, however, the rest will most often be a cingulum rest, which will be located well to the lingual of the labiolingual center of the tooth. The prepared guide plane area should extend no further labially on the proximal surface than the labial limit of the rest seat preparation. (Fig. 8). Lingually it should extend all the way to the lingual surface and be blended in with it.



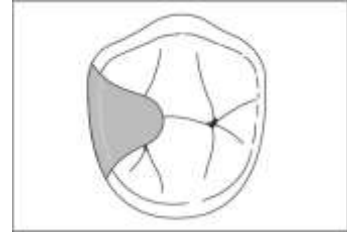
Incisogingivally, the guide plane should be prepared to $\frac{2}{3}$ the available incisogingival height of the proximal surface in this area. It is often the case with anterior teeth, that the vertical component of the proximal surface is 1.0 mm or less in height. If so, there is no point in trying to prepare a guide plane on so short a surface.

Proximal guide plane on an anterior tooth extends from the labial limit of the rest seat to the lingual surface. It is $\frac{2}{3}$ the gingivo-incisal height of the proximal surface. Guide plane on posterior tooth is $\frac{2}{3}$ the occlusogingival height and $\frac{2}{3}$ the buccolingual width, located centrally.

In cases presenting mesial tilting anterior abutments should consider mesial guide plane preparation. The tooth is recontoured to minimize the mesial undercut. This is particularly helpful in some Kennedy Class IV cases.

REST AND REST SEAT PREPARATION

Rest seats are depressions created on certain surfaces of the abutment teeth after the guide planes have been established. Their placement is a variable of the framework design based on consideration of the distribution of forces, the materials, and the patient's occlusion.

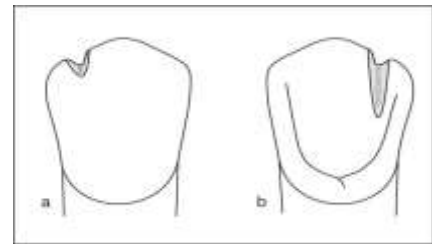
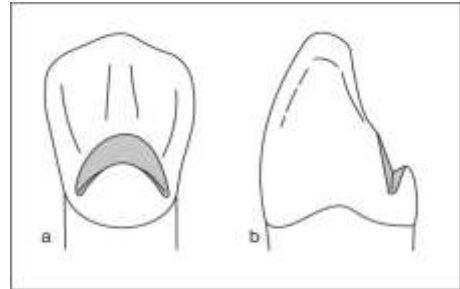


There are three basic types of conventional rest seats: occlusal, cingulum and incisal.

Rest Function

Rests have as a main function the transmission of some of the forces to the abutment teeth. Other functions of rests are:

1. Resist displacement of the denture caused by occlusal load.
2. Maintain clasp assembly in its relationship to the abutment tooth.
3. Prevent settling of the denture into the residual ridge.
4. Prevent food impaction between denture and natural teeth.
5. Maintain occlusion with the opposing teeth.
6. Prevent extrusion of the abutment teeth.
7. Act as indirect retainers.
8. Complete the anatomy of the abutment tooth.



Armamentarium

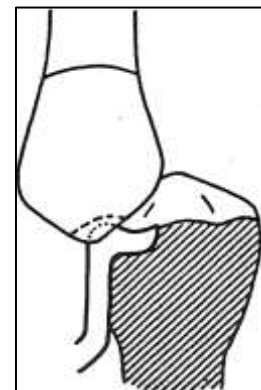
The instruments needed to form any rest seat on natural dentition, composite or amalgam are:

1. #4 and #6 round, #35 inverted cone, and #7205 tapered cylinder friction grip carbide burs
2. #7008 and #7104 finishing burs
3. rubber points for friction grip handpiece
4. Moore's sandpaper and cuttle disks
5. prophyl brush and cup for contra angle
6. pumice and topical fluoride

Occlusal Rest Seat

Due to the material limitations of the chrome cobalt alloy, the finished occlusal rest must be at least 1.5 mm thick. There must therefore be at least 1.5 mm clearance space between the rest seat and the opposing dentition. In order to prevent dentin exposure, the rest seat will be 1 mm deep at the marginal ridge area and 1.5 mm deep towards the center of the tooth. Therefore, there will be a slight (.5mm) overcontouring the rest at the marginal ridge area. If an opposing tooth is in contact at the marginal ridge, it should be reduced to provide the clearance for the rest.

To form an occlusal rest, a #4 round bur in the high speed handpiece is used to reduce approximately 1 mm of enamel or restoration at the marginal ridge.

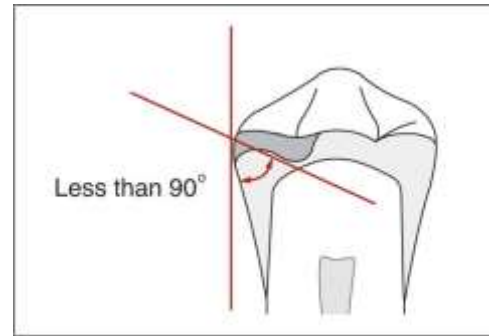


The bur is then moved toward the central sulcus until a trough about 1/3 the mesio-distal width of the tooth is formed. The #6 round bur is then placed in the end of the trough and the rest seat is deepened another 0.5 mm.

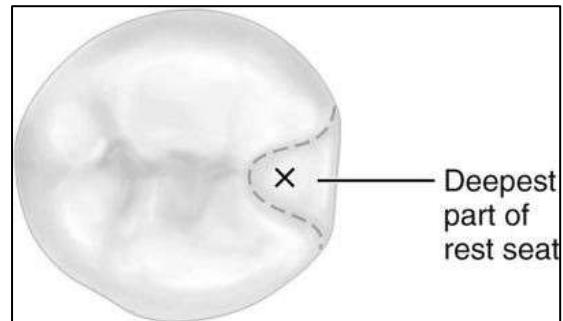


The axial end of an occlusal rest is always deeper than the marginal ridge end, thus the floor of the preparation is blended and smoothed to slope towards the center of the tooth. This shape and angle will transmit vertical forces along the long axis of the tooth and prevent migration of the tooth away from the rest.

The rest seat is then flared. The flaring at the occlusal surface is done to prevent undercuts in the path of insertion. Flaring is also done at the marginal ridge area to add bulk to the casting for strength. A #8 round finishing bur usually works best for both types of shaping. The bur is lightly used on the line angles only, not in the bottom of the rest seat. Next a fine diamond is used to smooth the cava-surface margin. There should be no sharp edges in the finished preparation.



Width- toward the center of the tooth, the rest seat will be 1-1.5 mm wide at the floor of the preparation and 1.5-2 mm wide at the cava-surface margin. At the junction with the minor connector, (marginal ridge area) the rest seat will be 1.5 mm wide at the floor of the preparation and 2.5 mm wide at the cava-surface margin. These dimensions allow the flare towards the occlusal edges to prevent undercuts and the flare at the minor connector junction to increase strength.

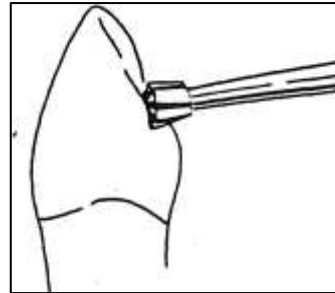


The rest seat is smoothed by using rubber points with an upward sweeping motion at slow or high speed.

The seat is finally polished using pumice with prophylaxis brush and cup. The area of cut enamel is treated with fluoride solution to promote surface remineralization and reduce sensitivity.

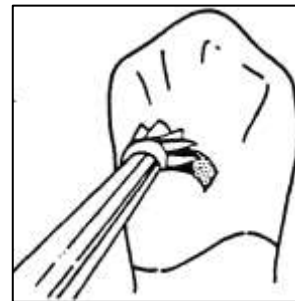
Cingulum Rest Seat

To form a cingulum rest, a #35 inverted cone bur is used to create the initial form of the preparation. The handpiece is held so that the head of the bur makes a V-shaped cut in the enamel of the top of the cingulum. It is extremely important that the deepest portion of the rest is toward the long axis of the tooth. This means that the angle formed by the lingual surface of the tooth and the rest seat is less than 90 degrees. (See FIG. 10) This angle will both transmit vertical forces in the long axis of the tooth, and stabilize the tooth and the partial denture by resisting forces in the linguolabial direction. A cingulum rest angle more obtuse than 90 degrees will not resist these displacing forces.

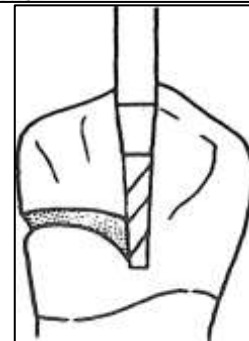


The #35 cutting head is approximately 1.0 mm in diameter and 1.25 mm high. The bur is drawn mesially and distally from one proximolingual line angle to the other to form a V-groove shaped mesiodistally like a shallow inverted U. Be careful not to penetrate more than 1.0 mm into the enamel.

Great care should now be taken to remove enough tooth structure where the rest will connect with the minor connector. In this area the framework frequently interferes with the occlusion, especially in lateral excursive movements. At this point, the metal must be at least 1.5 mm thick to minimize the probability of framework failure. The rest seat in a natural tooth, however, should be 1.0 mm deep, but never more, to avoid perforating through the enamel into dentin. It is important, therefore, either to locate the rest and minor connector in an area that will avoid occlusal impingement, or to reduce the opposing tooth or teeth to permit a 1.5 mm thickness in the rest and minor connector.



As with preparation of the occlusal rest seat, you must make sure that no portion of the rest seat is undercut relative to the path of insertion. This means that, usually, you will have to reduce the axial wall of the rest by flaring it slightly toward the labial tooth surface. Use a #7205 carbide bur to reduce the axial wall, without altering the basic cross-sectional V-shape of the rest seat.



If necessary, the prepared areas of the rest seat should be smoothed with fine sandpaper disc, polished carefully with high-speed polishing points (brown, then blue Shofu), and finally with flour of pumice. Fluoride gel is then applied to reduce caries susceptibility. If the prepared rest seat has perforated through the enamel into dentin, you should replace the area of exposed dentin with a small amalgam restoration. The tooth preparation for the amalgam is easily and quickly made and slightly undercut with a #33 ½ inverted cone bur, usually without anaesthesia. The entire procedure should take less than 5 minutes and will help avert future caries without delaying the final impression for the partial denture framework.



Incisal Rest Seat

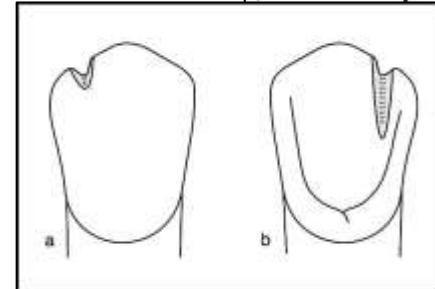
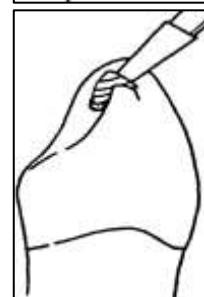
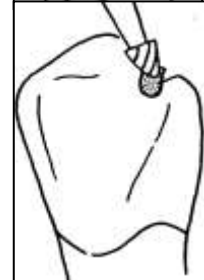
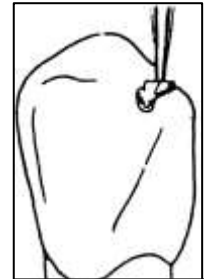
An incisal rest seat is formed with two burs. An initial depth cut, the width of a #4 round bur, is made at the junction of the middle and the mesial or distal 1/3 of the incisal edge of the abutment tooth.

The walls of the rest seat are created by flaring the edges of the depth cut preparation with a #7104 finishing bur. As with all rest seats, the rest seat is designed to direct forces down the long axis of the tooth

This flaring is done in such a manner that a wedge-shaped cut with a rounded bottom is formed. The labial and lingual edges of the preparation are beveled with the #7104 bur or the flame-shaped diamond so that the preparation is rounded labio-lingually. The preparation is saddle-shaped labiolingually with bevels on the labial and lingual surfaces.

The rest seat is finished by smoothing and polishing with the #7104 flame-shaped finishing bur.

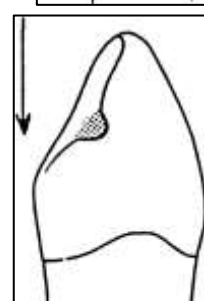
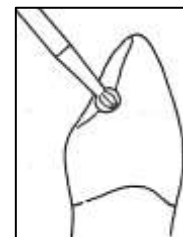
For all rest seats, sufficient tooth structure must be reduced to avoid occlusal interference. If the rest seat must be placed where an occlusal contact occurs, at least 1.5 mm of tooth structure should be removed. If the existing enamel is only 1 mm thick, the incisal rest may be slightly over-contoured (by .5mm) and the opposing occlusion adjusted. Only slight over-contouring is acceptable in order to maintain a regular plane of occlusion. The area where the rest is to be placed is always checked in protrusive and, particularly, lateral excursions to find out if enough tooth structure has been cut away for the necessary 1.5mm thickness of framework.



Lug Rest Seat

A lug rest is a ball-shaped rest placed on the marginal ridge of an anterior tooth. It is much less commonly used than cingulum or incisal rests. However, it is a useful compromise when one of these other types may be impossible because of esthetic or interocclusal clearance limitations. The lug rest is placed on the lingual surface. It is located inciso-gingivally in the middle third of the marginal ridge; it may be as far gingivally as the cingulum, and as far incisally as the junction of the middle and incisal third of the marginal ridge.

To prepare a lugrest seat, a #4 round bur is used to make a hemispherical cut in the marginal ridge half the diameter of the bur in depth. As in the case with the cingulum rest seat, it is imperative that the lug rest seat be deeper toward the labio-lingual midline of the tooth than it is at the lingual surface.



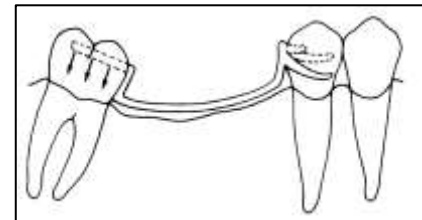
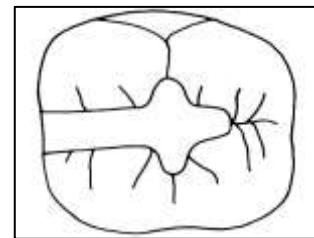
The first bur cut will leave a half-round depression in the marginal ridge enamel whose incisal border is undercut. (FIG. 19) The overhanging incisal lip of enamel must be flared toward the incisal and labial surfaces to eliminate the undercut and accommodate the planned path of insertion of the partial denture. To accomplish this, use the #4 or #7104 bur. Reduce the overhanging incisal enamel wall of the rest seat with a brushing motion of the bur toward the incisolabial without reducing the lingual wall of the rest seat.



Keep it in mind, that to provide proper support, the rest must be deeper toward the labia-lingual midline of the tooth than it is at the lingual surface. You may test the stability by placing the ball end of a ball burnisher in the rest seat and applying pressure in an apical direction. It should not slip out of the preparation. If it does, deepen the preparation with a #2 round bur without generate another undercut.

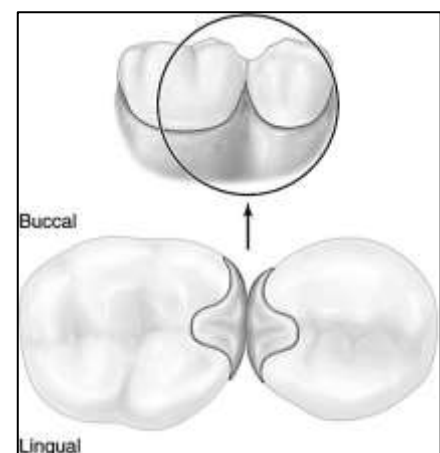
Extended Occlusal Rest

In Kennedy Class II, modification 1, and Kennedy Class III situations in which the most posterior abutment is a mesially tipped molar, an extended occlusal rest should be designed and prepared to minimize further tipping of the abutment and to ensure that the forces are directed down the long axis of the abutment. This rest should extend more than one-half the mesiodistal width of the tooth, should be approximately one-third the buccolingual width of the tooth, and should allow for a minimum of 1-mm thickness of the metal; the preparation should be rounded with no undercuts or sharp angles.



Interproximal Occlusal Rest Seats

The design of a direct retainer assembly may require the use of interproximal occlusal rests. These rest seats are prepared as individual occlusal rest seats, with the exception that the preparations must be extended farther lingually than is ordinarily accomplished. Adjacent rests, rather than a single rest, are used to prevent interproximal wedging by the framework. In addition, the joined rests are designed to shunt food away from contact points. When such rest seats are prepared, care must be exercised to avoid reducing or eliminating contact points of abutment teeth. However, sufficient tooth structure must be removed to allow adequate bulk of the component for strength and to permit the component to be so shaped that occlusion will not be altered. Therefore analysis of mounted diagnostic casts is mandatory for assessment of interocclusal contact areas in which rests are to be placed. Sufficient space must be present or created to avoid interference with the placement of rests.

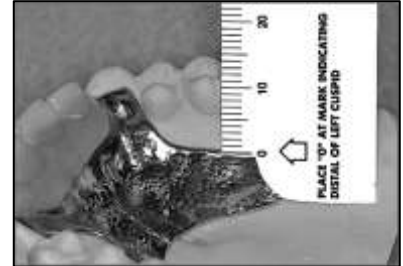


Major and Minor Connectors

Major Connectors: connecting the parts of the prosthesis located on one side of the arch with those on the opposite side, all parts of RPD attached.

Requirement of major connectors

- 1) Rigidity: Stress applied to any portion of RPD should be effectively distributed.
- 2) Protection of soft tissue:
 - Maxillary: 6mm away from gingival crevice
 - Mandibular: 3mm away from gingival crevice
- 3) Indirect retention: crossing the hard palate in both
- 4) Means to connect of denture bases:
- 5) Patient comfort: Preventing food entrapment and providing self-cleansing Anterior border of maxillary connectors should end in the valleys between rugae crests. Margins should not cross bony or soft tissue prominences (tori).



MAXILLARY MAJOR CONNECTORS

Beading: 0.5-1.0mm on the master casts

PURPOSE of beading:

- 1) Provides marginal seal.
- 2) Prevents food debris from collecting under major connectors.
- 3) Provides technician finish line.
- 4) Increases denture strength.

1) Single palatal bar:

The palatal bar should be limited for the use of Kennedy Class III cases. It is rarely used.

The main disadvantage is its bulkiness.

2) Palatal strap: 8mm wide at least

Advantages:

- a. Because the palatal strap is inherently strong, it can be kept relatively thin.
- b. less interference with tongue, more likely to be accepted by patient.
- c. the increased tissue coverage helps distribute applied stresses over a larger area.

Disadvantage:

- a. Patient might complained about the palatal coverage.
- b. Might cause papillary hyperplasia
- c. might not be suitable for long, bilateral distal extension cases

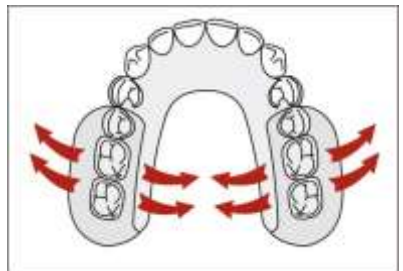
3) Anteroposterior bars: the combination of an anterior strap and a posterior bar

Advantages:

- a. rigid,
- b. The two bars, lying in different planes, produce a structurally strong L-beam effect.
- c. Might be used for patient with mid palatal torus.

Disadvantage:

- a. The anteroposterior palatal bar is frequently uncomfortable. The bulk and contour of the connector may be bothersome to the tongue and may interfere with phonetics.
- b. Limited contact with the palatal tissues, the anteroposterior palatal bar derives little support from the bony palate.
- c. Contraindicated in patients with reduced periodontal support.



4) Horseshoe, or U-Shaped major connector

Advantages:

- a. used when several anterior teeth are being replaced
- b. used in the presence of a hard median suture line or an inoperable torus

Disadvantages:

- a. a poor choice for distal extension partial denture. When vertical force is applied to one or both ends of a horseshoe major connector, there is a tendency for the connector to flex or deform.



5) Anteroposterior palatal strap

The A-P palatal strap connector is a structurally rigid connector that may be used in most maxillary partial denture applications. It is particularly indicated when numerous teeth are to be replaced and when a torus is present.

Advantages:

- a. The corrugated contour over the rugae adds strength without adding thickness.
- b. The structural encirclement produced by the A-P straps contributes to the rigidity.
- c. The shape of this connector also provides a definite L-beam effect.

Disadvantages:

- a. Interference with phonetics may occur in some patients.
- b. the extensive length of borders may cause irritation to the tongue.

6) Complete palate: can be All acrylic resin, combination metal and acrylic resin, all metal.

Advantages:

- a) provides proper posterior palatal seal
- b) provides the best stabilization in shallow vault or flabby ridge
- c) good for the transition to complete denture
- d) all-metal palate enhances the transfer of the temperature changes

Disadvantages:

- a) inflammation and hyperplasia may happen because of extensive soft tissue coverage
- b) may have phonetic problems



Structural requirements for maxillary major connectors

1. The borders must be placed a minimum of 6 mm from gingival margins or extended onto the lingual surfaces of the teeth. The location is determined by the need for support, stabilization, and/or oral hygiene.
2. Relief is normally not required under maxillary major connectors.
3. Borders that extend onto the anterior palate should blend with the palatal anatomy. This may be accomplished by positioning borders on the appropriate slopes of the rugae.
4. The anterior and posterior elements of an antero-posterior palatal strap should be at least 8 mm wide. The posterior strap should be located in the farthest posterior position possible without contacting the movable soft palate.
5. All borders should taper slightly toward the underlying soft tissues.
6. Both anterior and posterior borders should cross the maxillary midline at right angles, never diagonally.
7. For those major connectors that present open central areas, the medial borders should be positioned at the junctions of the horizontal and vertical surfaces of the palate. For gently curved palates, the proper locations must be approximated. Appropriate placement is necessary to minimize patient awareness and potential discomfort.
8. Thickness of the metal should be uniform throughout the palate.
9. Borders of the metal framework should be gently curved, never angular.
10. The metal should be smooth but not highly polished on the tissue surface (ie, intaglio).
11. All borders that contact soft tissues should display bead lines. The bead lines should become less distinct as they approach the gingival margins of the teeth.

Indications for maxillary major connectors

1. If the periodontal support of the remaining teeth is weak, more of the palate should be covered. A wide palatal strap or a complete palate is indicated.
2. If the remaining teeth have adequate periodontal support and little additional support is needed, a palatal strap or antero-posterior palatal bar may be used.
3. For long-span distal extension bases where rigidity is critical, an antero-posterior palatal strap or complete palate is indicated.
4. When anterior teeth must be replaced, an antero-posterior palatal strap, complete palate, or horseshoe major connector may be used. The final selection must be based on modifying factors such as number and location of missing posterior teeth, periodontal support of remaining teeth, and type of opposing occlusion.
5. If a torus is present and is not to be removed, an antero-posterior palatal strap, antero-posterior palatal bar, or horseshoe major connector may be used. Final selection must be based on modifying factors.
6. A horseshoe connector should be used very sparingly. Flexure of this major connector may permit the concentration of forces upon individual teeth or localized segments of the maxillary arch.
7. A palatal bar is rarely indicated.

MANDIBULAR MAJOR CONNECTORS

The main differences between the maxillary and mandibular major connectors is the supporting structures. The palatal coverage provides great support to the maxillary RPD. On the other hand, **relief** must be routinely provided between the mandibular major connector and the soft tissue. Relief prevents the margins of the major connector from lacerating the sensitive lingual mucosa as a result of this movement. No bead lines should be used with the mandibular major connectors.

1) Lingual bar:

- a. half pear-shaped bar in cross-section, with the broadest portion at the inferior border of the bar
- b) lingual bar 5mm in height, the space between gingival margins and connector 3mm. There should be at least 8mm of vertical space between the active tissue of the floor of the mouth and the gingival margin of teeth. In the 2nd diagnostic data collection visit, a periodontal probe should be used to measure the depth of lingual vestibule.
- c) lingual bar can rarely be used over mandibular tori

Advantages

- a. simple
- b. minimal contact to oral tissue
- c. reduced plaque accumulation

Disadvantages:

needs certain thickness to keep rigid.

2) Lingual plate:

Wide, thin half pear-shaped strap with a thin, solid plate of metal extending upward onto the lingual surfaces of teeth. Inferior portion must have enough relief to prevent damaging soft tissue. Superior border must seal teeth embrasures to prevent food impaction.

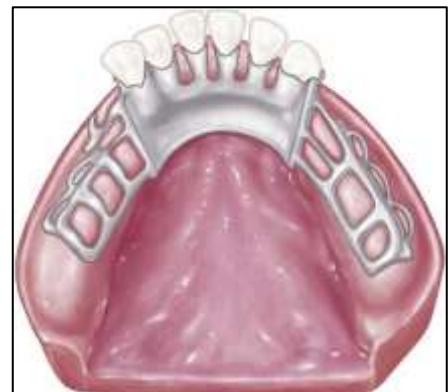
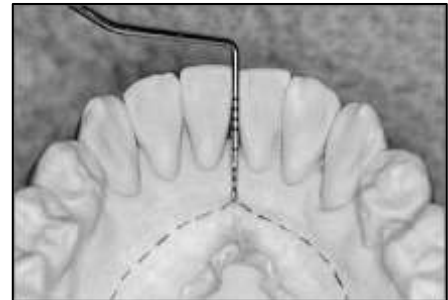
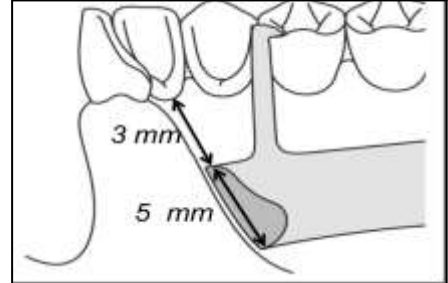
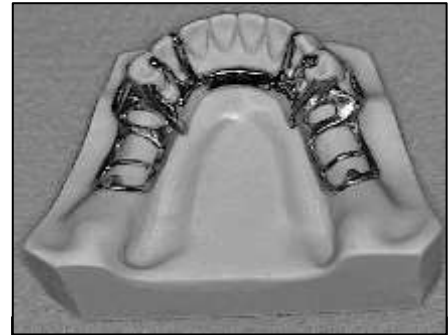
The superior border of a lingual plate must be contoured to intimately contact the lingual surfaces of the teeth above the cingula. In addition, the lingual plate must completely close the interproximal spaces to the level of the contact points.

When diastemata are present in between the mandibular anterior teeth, an interrupted lingual plate major connector can be used to prevent metal showing. This type of design will cause plaque accumulation problems and also can reduce the rigidity of major connector.

The linguoplate does not in itself serve as an indirect retainer.

When indirect retention is required, definite rests must be provided for this purpose.

Advantages:



- a. can be used as additional indirect retention [lingual plate itself is not properly an indirect retainer]
- b. can be used as periodontal support and splinting.
- c. used when there is insufficient vertical space for lingual bar
- d. used when there is mandibular torus
- e. used in bilateral distal extension RPD's with severe residual ridge resorption
- f. used when there is possibility of tooth loss requiring replacement- lends itself to easy addition of a replacement tooth
- g. it is the most rigid mandibular connector, providing more support and stabilization

Disadvantages:

- a. oral hygiene challenges, more plaque accumulation.
- b. more likely can cause soft tissue irritation.



3) Double lingual bar (Lingual bar and continuous lingual clasp), or Kennedy bar

it is indicated when some degree of indirect retention is required but there are large interproximal embrasures

Advantages:

- a. provide proper indirect retention
- b. improve horizontal stabilization
- c. Because the gingival tissues and the interproximal embrasures are not covered, a free flow of saliva is permitted and the marginal gingiva receives natural stimulation.

Disadvantages:

- a. discomfort to the tongue
- b. entrapment of food debris

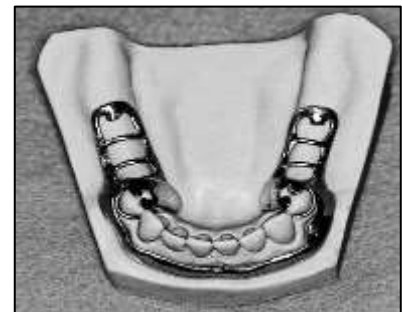


4) Labial bar

Very rarely used.

The only justification for using a labial bar is the presence of a gross uncorrectable interference that makes the placement of a lingual major connector impossible. Interferences that commonly lead to the selection of a labial bar are

- (1) malpositioned or lingually inclined teeth and
- (2) large mandibular tori that preclude the use of a lingual bar or lingual plate.



Indications for mandibular major connectors

1. For a tooth-supported removable partial denture, the lingual bar normally is the mandibular major connector of choice.
2. When there is insufficient room between the floor of the mouth and the gingival margins (< 8 mm), a lingual plate should be used. This major connector also is indicated for patients with large inoperable tori and patients with high lingual frenum attachments.
3. When the anterior teeth have reduced periodontal support and require stabilization, a lingual plate is recommended.

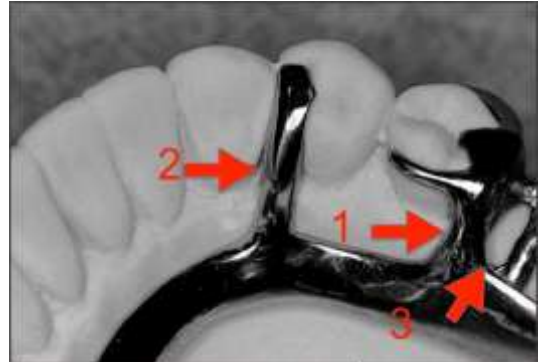
4. When the anterior teeth exhibit reduced periodontal support and large interproximal spaces, a modified lingual plate (ie, step-back design) or double lingual bar should be used.
5. When a removable partial denture will replace all mandibular posterior teeth, a lingual plate should be used.
6. A labial bar is rarely indicated.

MINOR CONNECTOR

- 1) Minor connector that join clasp to the major connector-

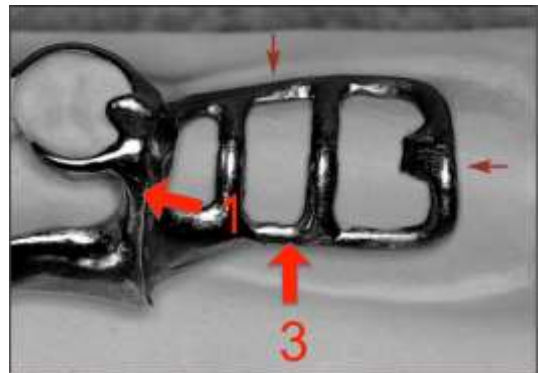
They connect to retentive clasp, rest to the major connector

- a) must be rigid
- b) must be placed in the embrasure between two teeth to provide sufficient bulk



- 2) Minor connectors that join indirect retainers or auxiliary rests to major connector

They should form a right angle with major connector, but the junction should be a gentle curve rather than a sharp angular connector



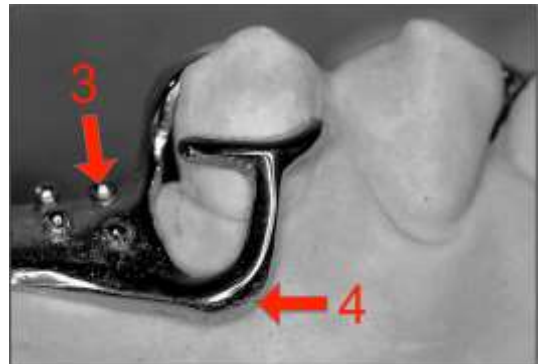
- 3) Minor connectors that join the denture base to the major connector

Open lattice work construction

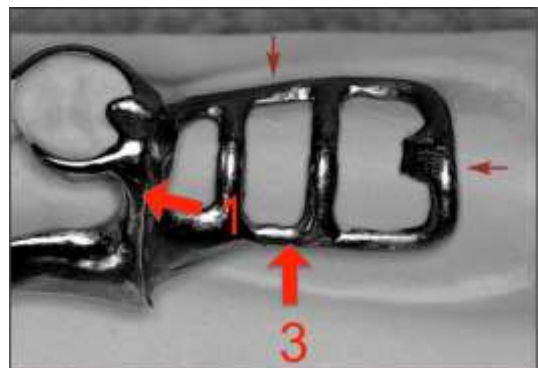
Mesh construction

Bead, wire, or nail head retention connector

Attachment to major connector: Acrylic resin cannot be finished to a thin edge. Butt joint is necessary.



- 4) Minor connectors that serve as approach arm for vertical projection or bar-type clasp



Visit # 3 Mouth preparation and Final framework impression

[Please refer to the RPD treatment sequence handout]

In NSU Pre-doctoral clinic, before you schedule the patient for this visit,

- a. all phase 1 treatment should be completed already.
- b. All planned surveyed crowns or FPDs for RPD abutments should be completed following the planned RPD design
- c. A pre-prosthetic evaluation visit should be scheduled first. Because you need new diagnostic casts to confirm the design. (Simply, the teeth might have been moved after perio treatment, height of contour could have changed, the survey crowns might not be ideal. The restorations might be more extensive than what you expect, or a worse scenario, the abutments you planned is no longer there.....)
- d. You might want to practice the rest seat preparation on these diagnostic casts.

Final Mouth Preparation

The RPD design/ worksheet and the design cast / mounted diagnostic cast should be present and checked by the clinical faculty.

Tooth preparation is irreversible process, poor execution and careless oversight should be avoided.

Step I: Going over the design tooth-by-tooth to confirm the preparation needed

Step II: Preparation of guide planes

Preparing the guide planes first helps the clinician

1. To make sure all guide plane parallel to the path of insertion.
2. To establish the amount of reduction in the marginal ridges area in order to determine the extent of rest seat preparation.
3. To use the guide planes as reference while altering other axial contours.

Please follow the guidelines in the guide plane and rest seat preparation handout.

Step III: Preparation of rest seats:

Please follow the guidelines in the rest seat preparation handout.

The preparation should be examined carefully to ensure the floor of the rest seat is properly inclined and that the preparation display adequate depth. A piece of boxing wax is formed into a disk and firmly pressed against the occlusal surface of the prepared tooth. Then, the patient is instructed to close firmly. The thickness of wax can be measured. It represents the clearance between the floor of rest seat and the opposing occlusal table. Rest seat should be polished with rubber points.

Step IV: Alteration of Axial Contours of abutment

While guiding plane surfaces are the most common axial tooth preparations made for removable partial dentures, other axial preparations may also be required. These include:

A. Lowering Height of Contours

1. Lowering height of contours to eliminate tooth interferences in areas where rigid components will be placed (such as rigid portions of retentive arms).
2. Lowering height of contours to improve esthetics (e.g. to allow retentive arms to be placed more gingivally to reduce clasp display).

When preparing axial contours for these situations, the heights of contour are most quickly lowered by placing the bur parallel to the path of insertion.

B. Raising Height of Contours

The only time that a height of contour would be raised would be when there is no retentive undercut present or when the undercut is so far gingival that the retentive tip would either impinge on the free gingival margin or cause a hygiene problem due to its proximity to the free gingival margin. In general, the inferior portion of the retentive undercut should be *at least* 2 mm above the free gingival margin. Raising the height of contour is only feasible when the axial surface is parallel or slightly divergent to the path of insertion. If the surface is grossly divergent from the path of insertion, then raising the height of contour may be impossible.

Raising the height of contour for retentive undercuts can be accomplished by:

1. Wide Depression Undercut

When it is desirable to create a deep undercut or when the abutment is next to a Class I or Class II edentulous area, a wide depression should be formed.

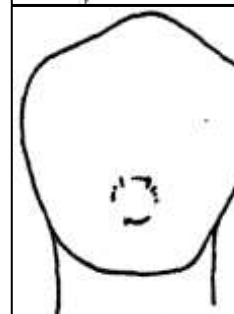
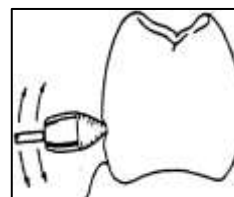
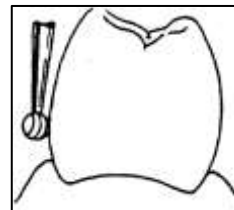
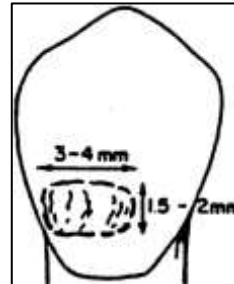
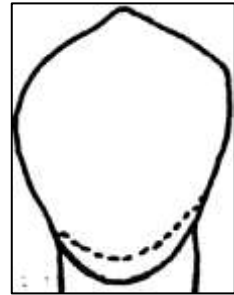
Preparation on study casts is a prerequisite to intraoral preparation.

If the height of contour is in the gingival $\frac{1}{3}$, it would be impossible to place a retentive clasp arm beneath the survey line without impingement of the gingiva.

A #7104 finishing bur is the primary instrument used for this modification. The modification is started on the natural tooth by creating an elliptical depression about 2mm in height by 3 to 4mm in length. Some accuracy of depth in the preparation of the undercut can be found if the #7104 is placed against the modified study cast to see to what depth the bur will cut into enamel. The desired depth will be that necessary to create the desired .01" to .02" undercut. (Fig. 3)

As a guide, note that the #7104 is 1.0mm in diameter. Since .01" is equal to .25mm, the desired depth of undercut will be one fourth to one half of the diameter of the bur.

The finished modification is examined.



2. Dimple Undercut

A "dimple" is the easiest type of retentive recontouring to place in enamel. Its use is limited by the amount of undercut that must be created and by the edentulous classification of the prosthesis.

Next to class I or II edentulous areas the dimpled retention for a bar arm is usually unsatisfactory. The mesial and distal walls of the dimple will prevent the bar arm from moving further into the undercut when the denture is displaced around the fulcrum line either occlusally or toward the tissue. This would negate one of the main reasons for using bar arms; their ability to disengage from the abutment tooth during the vertical movements of the saddle, and, by so doing, preventing torquing movement to the abutment.

If creation of a dimple undercut seems necessary, intraoral tooth preparation may be started, but only after practicing the procedure on a diagnostic cast. A #4 round bur is placed against the abutment tooth vertically. The bur is moved into the enamel until the shaft of the bur touches the tooth. This will create the necessary quarter millimeter depression in the enamel. Rubberpoints are then used to polish the sharp edges of the depression. A smooth depression is thereby created for retention only in the enamel of the abutment tooth.

Step V : A quick impression and verification cast

It is wise to check for proper preparation by making an alginate impression and pouring it in quick setting plaster so that the parallelism and undercut can be examined with a surveyor.

ABUTMENT COVERAGE WITH CROWN RESTORATIONS

In order to have a successful combined prosthetic rehabilitation which includes cast crown abutments and a removable partial denture, it is essential to plan ahead.

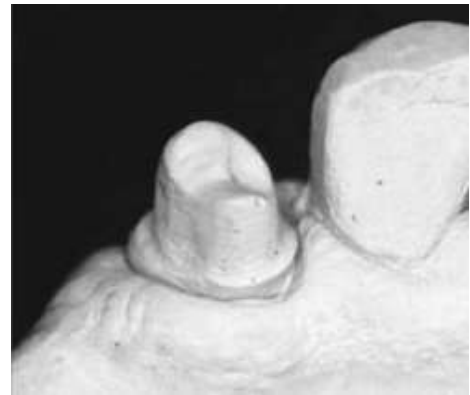
Preparation

The full crown preparation must be altered to receive a cast crown abutment for a removable partial denture in order to have enough clearance space in the rest seat area. First, a normal preparation with 1.5 - 2.0mm occlusal reduction is completed. Then, the rest seat area of the preparation is deepened another 1.0- 1.5mm. This deepening must extend buccally and lingually enough to allow for flaring of the final rest seat. A distinctly outlined rest seat is not made in the crown preparation - only in the subsequent wax pattern for the crown.

Restoration

The crown should be waxed to normal contour and occlusion before any alterations for the partial denture framework are made. While performing these alterations, four criteria must be kept in mind. These are:

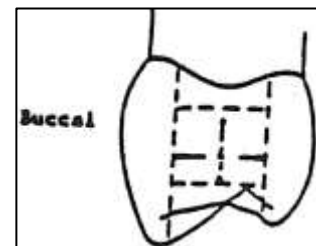
1. Adequate guide planes
2. Positive rest seats
3. Proper retention
4. Proper bracing



Cast crown abutments must be fabricated in the laboratory for proper guide planes, rest seats, retentive and bracing areas. It is nearly impossible correctly to alter the contour of a crown after it has been cemented.

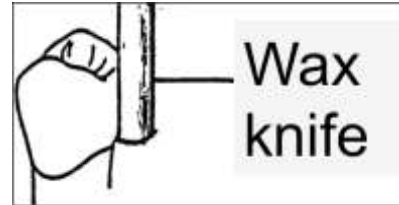
1. Guide planes

Place the crown waxed to normal contour and occlusion on the cast. The cast should then be placed on the surveying table and oriented to the path of insertion decided upon for the partial denture.



The proximal surfaces that are going to be used as guide planes will be altered so that at least 2/3 the buccolingual width of the cusp tips and 2/3 the occluso-gingival length are parallel to the path of insertion.

The guide plane modification will be done by placing the wax knife in the surveying arm and gently *shaving* the proximal surface until the proper width and length of the guide plane are established.



The guide plane should not be flat bucca-lingually. It will follow the normal curvature in the buccolingual direction. Particularly in the buccal and lingual line angle areas.

If the wax-up is going to be cut back to receive porcelain, the guide plane created should be left intact. A guide plane must always be on the cast metal surface of the crown, never on the porcelain. This will provide metal-to-metal contact between the guide plane and proximal plate.

2. Rest seats

After guide plane modification, the next step will be to place the rest seat in wax. The rest seats are always prepared after guide plane modification.

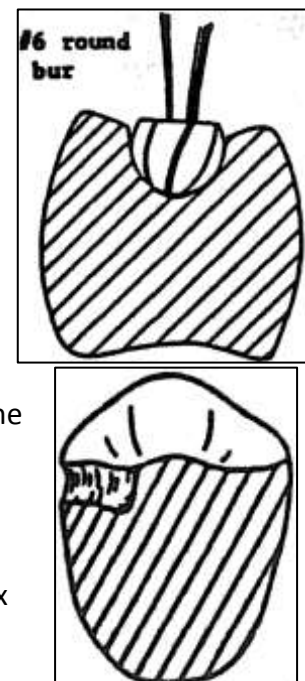
A #6 round bur (hand worked, not using the handpiece) is just about ideal for placing rests. Its width is 1.7-2mm. This is sufficient for the buccolingual width of a rest. Remember, chrome cobalt grain size can be up to 1.5mm. thus, to minimize fracture it is best to have a rest seat wider than the largest possible grain particle.

Placing the bur to its full depth gives proper depth at the marginal ridge region of the rest; after the crown is polished, this depth will be approximately 1.5mm.

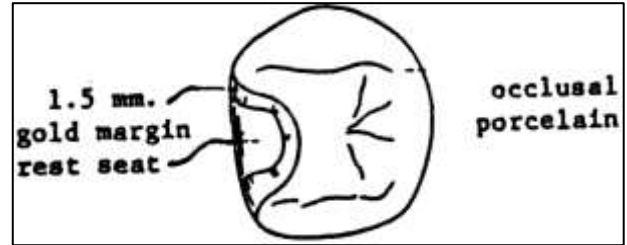
The rest seat should be placed slightly closer to the middle of the tooth than to the marginal ridge. How close depends upon the mesiodistal width of the particular retainer. However, the mesiodistal length of a rest preparation should be approximately one-third the total mesiodistal width of the tooth. (Fig. 5)

The rest seat should be spoon shaped. The deepest portion is placed toward the center of the tooth to prevent proximal slipping of the framework and to concentrate the forces nearest the center of the tooth. Deepening the rest seat can be done by using a round bur.

Finally, the marginal ridge region and the occlusal line angle are smoothed and rounded using the discoid end of a cleoid-discoid wax instrument.



If the crown is to be veneered with porcelain or if the whole occlusal surface is to receive porcelain, a sufficient margin of metal around the rest seat must be maintained. This margin will prevent cold working of the cast metal and subsequent fracture of the porcelain. About 1 to 1.5mm. is a proper margin of metal.



REST SEATS SHOULD NOT BE PREPARED IN PORCELAIN!

3. Retention

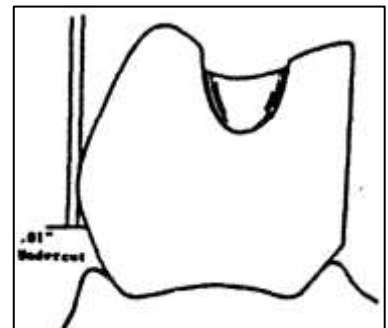
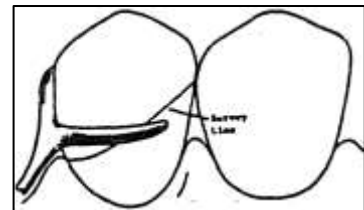
The retentive area of the crown is usually on the buccal surface. The particular area in which the undercut is placed will be determined by

- a. The path of insertion of the RPD
- b. the type of retentive clasp arm used.

You will be creating in wax the ideal height of contour for the type of retentive arm used.

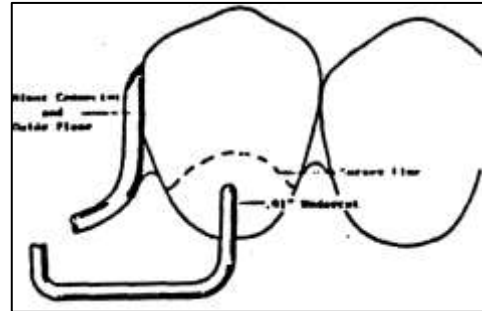
When the undercut is prepared for a circumferential clasp, it is in the "far" (that surface of the tooth farthest from the edentulous area). It is best for physiological reasons to keep this undercut away from the gingival tissues. Yet for esthetics and force distribution it is desirable to keep it quite gingival. Therefore, usually the junction of the middle and gingival thirds is the best compromise for locating the undercut.

It is also best to keep the retentive arm as horizontal as possible. Esthetics are generally better, and the arm will only have to flex in one plane. Single plane flexure will cause less stress or shearing action on the clasp arm. It will also allow greater flexibility of the retentive arm. It is less difficult to flex a straight beam than it is to flex a curved one. To keep it horizontal, the retentive arm should arise from the minor connector at the same level as the retention, i.e., the junction of the mid and gingival third. This can be accomplished by making the survey line more gingival on the "near" (surface closest to the edentulous area) and more occlusal on the "far" side.

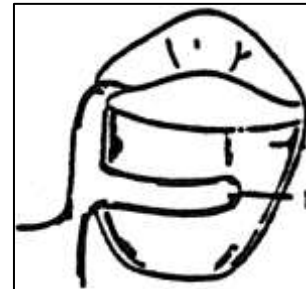


The retentive undercut should only be .01. No more. (For ease of placing in wax, it should be .015" or .02", but after polishing only .01" undercut should remain.)

On placing retention for a Bar Clasp (Roach or Infrabulge), it is again desirable to have the undercut at the junction of the gingival and mid one-third. Depending on the type of Bar Clasp desired, the retention can be placed in the middle, or to the distal: mechanically there is very little difference. However, if esthetics is no consideration, the mid third is best

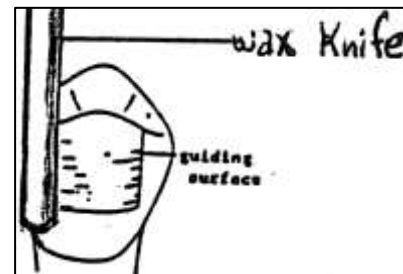


There is little problem encountered with porcelain facings fractured under a retentive arm if the metal understructure (framework) is of proper design and thickness. However, to minimize wear of the chrome-cobalt and scratching of the glaze, the biscuit bake should be smoothed very finely with a rubber wheel before staining and glazing.



4. Bracing

As previously noted, the bracing portion of the clasp must be in contact with the tooth as the retentive portion flexes into the undercut. This means the entire bracing surface must be parallel to the path of insertion (or guide planes). The bracing surface is usually prepared at the same time as the guide planes for obvious reasons.



The wax knife is placed in the surveying arm and wax is gently shaved from the bracing surface so that the surface is parallel to the path of insertion from the occlusal line angle to the junction of the mid and gingival thirds.

THE BRACING SURFACE OF THE CROWN SHOULD BE IN METAL. NEVER IN PORCELAIN

The cingulum rest can also be made to act as a bracing arm for reciprocation. In order to function as such, the rest must touch and brace the tooth as the retentive arm flexes over the undercut. Therefore, the lingual surface of the crown must be made parallel to the path of insertion of the partial denture.

The lingual surface is prepared for bracing much the same as the proximal guide planes are, by using the wax knife in the surveying arm. The wax is shaved in a mesiodistal direction until one is sure the rest will be sliding down the lingual surface at the same time the retentive arm touches the facial surface. The cingulum area can be slightly overcontoured labiolingually if necessary to ensure a positive rest seat.

It is wise to avoid overcontouring if possible because of occlusal and gingival problems. Therefore, sufficient reduction of the lingual slope in preparation of the abutment is strongly suggested.

Making the Impression for the Master Cast

In Prosthodontics, impressions are made, not taken!
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There are a number of impression materials and techniques that may be used to make final impressions for removable partial denture construction. Impression materials include alginates, polysulfides, polyvinylsiloxanes, and polyethers. Each of these materials has inherent advantages and disadvantages related to accuracy, surface detail, cost, etc. Impression techniques also may affect the accuracy of the impression and the resultant cast. Therefore, it is the responsibility of the dentist to choose the material and technique that will provide the best result under a variety of clinical conditions.

Impression materials

Alginate impression material is the most widely used and possibly the most versatile of the dental impression materials. The material of choice for RPD framework final impression is the Jeltrate regular set alginate from dispensing. The material is readily available, relatively inexpensive, easy to use, and dimensionally accurate. The primary drawback of alginate impression material is the inability to store the material for an appreciable length of time. Alginate impressions should be poured within 12 minutes of removal from the mouth. Another advantage of alginate impression material is that a custom tray is not required for most impressions. A custom tray is only used when a stock tray will not fit the dental arch. This may occur when the arch is extremely large or extremely small, or when tooth alignment precludes the use of a stock tray. The presence of tori or exostoses also may necessitate the construction of a custom tray.

Using a stock tray

Selecting the impression tray for the master impression

The first step in making the impression is to select an impression tray of the proper size to provide uniform thickness of alginate for an accurate impression. The tray should be one-fourth inch (6mm) wider on each side than the buccal surfaces of the posterior teeth. It should also be long enough to cover the retromolar pads or the maxillary tuberosities. Avoid a tray that is longer or wider than just specified. You will not be able to seat a too-wide tray accurately or comfortably in the mouth because of tray impingement on the mandibular coronoid process or on the lips. The posterior border of a tray too long will impinge on the mandibular ascending rami before the anterior part of the tray is in proper position.

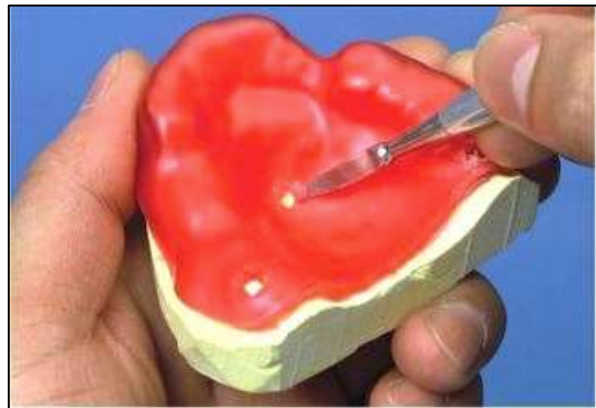
Altering the impression tray

The second step in making the impression is to modify the length of the selected stock tray. If it is too short, the tray is easily extended to proper length. Turn the tray over so that the non-impression surface is up. Drip melted sticky wax across the distal one-half inch of the outer posterior border area of the tray. Soften a sheet of pink base plate wax in a Micro-torch or Bunsen burner flame, fold it lengthwise to produce a two-layer strip one inch wide. Cut this double strip from the sheet and adapt it to the posterior part of the tray so that one-half inch adheres to the tray and one-half inch extends the tray posteriorly from one distobuccal border to the other. While the wax is still soft, fit the tray in the mouth and contour the wax extension so that its distal border contacts the palate or retromolar pad areas where you wish the impression to end.

Another method of modifying a stock impression tray is by using modeling plastic. The modeling plastic is softened in a water bath at 60°C (140°F) and molded over the area of the tray that requires modification. While the modeling plastic is still soft, the surface is heated with an alcohol torch, tempered in the water bath, and seated in the mouth. This should result in a relatively accurate impression of the corresponding oral tissues.

Using Custom trays with elastomeric impression material

Sometimes, if the cases require, polysulfide can be used as the impression material. Custom trays need to be fabricated with 2 layers wax relief on teeth and 1 layer of wax relief on mucosa. Three tissue stops needed to allow proper seating of the tray. The position of handle might need to be modified to allow border molding.



Impression procedure

The impression procedure for a master impression is the same as that described for a diagnostic impression, with the exception that special care must be shown in recording the rest seat preparations that have been made in the abutment teeth.

1. Ensure that the patient is properly positioned for the impression procedure to be performed.
2. Select and modify the required impression tray or trays.
3. Rehearse the operator position and tray placement several times so that the patient is aware of his or her responsibilities.
4. Have the patient rinse and then place gauze pads.
5. Measure and mix the impression material according to the manufacturer's directions. Load the tray in small increments to avoid trapping air.
6. Remove gauze pads from the oral cavity and paint or inject impression material into critical areas (eg, peripheries, hard palate). Forcibly wipe the impression material onto all tooth surfaces.
7. Seat the tray as rehearsed. Manipulate the lips and cheeks to ensure that the peripheries are properly extended and that air is not trapped in the vestibules. For the mandibular

- impression, ensure that the patient's tongue is raised and then gently protruded.
8. Support the tray until the impression material has set. Never leave a patient unattended with an impression in the mouth.
 9. Following gelation, remove the impression with a rapid, sustained tug in the direction of the long axes of the teeth.
 10. Clean the impression by placing it under a gentle stream of cool water. If necessary, saliva and other contaminants may be removed by sprinkling dental stone onto the surface of the impression and lightly brushing with a soft camel-hair brush.
 11. Examine the impression to determine whether all details are accurately recorded. If there is any doubt regarding accuracy, reject the impression.
 12. Spray the impression using an appropriate chemical disinfectant. Allow the disinfectant to remain in contact with the impression for the period prescribed by the manufacturer.

All critical anatomy should be recorded:

Vestibular depths recorded accurately

Hamular notches (marked)

Vibrating line (marked)

Retromolar pads

Frenal attachments

Floor of mouth (measured)

It is helpful to mark the vibrating line prior to making an impression because partially edentulous

impressions cannot be resealed over the teeth to determine this critical landmark, after removal

from the mouth, since the impression will not fully or properly seat over tooth undercuts

Reasons for rejecting an impression

The following are specific reasons for rejecting and repeating an impression:

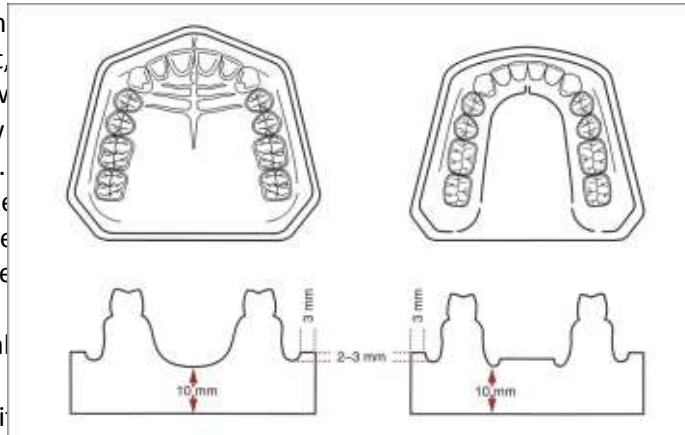
1. Bubbles or voids in and around rest seat preparations
2. Contact of cusps with the tray, especially when the teeth are involved in the framework design
3. Show-through between teeth and modeling plastic or modeling plastic and hard palate if the tray has been modified for an alginate impression
4. Voids or bubbles in the palatal vault when palatal major connectors are to be constructed
5. Peripheral underextension when a denture base has been designed and a corrected cast impression is not planned
6. Interproximal tearing of the impression material when coverage of those teeth has been designed
7. Lack of detail on the impression surface
8. Any doubt as to the accuracy of the impression

Pouring the Master Cast

The technique for pouring the master cast is the same as that for the diagnostic cast, except that a minimal expansion, improved artificial stone should be used. The NSU predoc clinic protocol is

RESINROCK for master casts.

1. After the impression is disinfected, it should be poured for a first pour.
2. Never allow the tray handle to touch the tray.
3. Do not make the impression too deep.
4. Have pre-wet the impression.
5. Make the first pour.
6. Be certain all air is removed.
7. After the initial pour, and add the second pour. Invert the impression with the first pour on a pad of stone and shape the base.
8. Between 45 and 60 minutes after the first pour, separate the impression from the cast if hydrocolloid material has been used.
9. Wet the cast thoroughly in slurry water by partially submerging it. Do not completely immerse the cast because this would prevent air from escaping from the stone and the cast will never be thoroughly wet.
10. Trim the cast.



and sprayed with disinfectant. The impression should be

Suspend it by the handle.

first.

ment.

complete the first

the stone surface

with slurry water

The base of the cast should be trimmed so that the occlusal surfaces of the teeth will be as parallel to the base as possible.

The cast should be 10 mm thick at its thinnest point—usually the center of the hard palate for the maxillary cast and the depth of the lingual sulcus for the mandibular cast.

The posterior border of the cast is trimmed next. It must form an angle of 90 degrees with the base and should be perpendicular to a line passing between the central incisors.

The sides of the cast are trimmed so that they are parallel to the buccal surfaces of the posterior teeth or to the crest of the edentulous ridge. Do not trim so close as to obliterate the vestibule or the buccal shelf. A land area or periphery at least 3 mm wide should be maintained around the entire cast.

The sides and the posterior borders are joined by trimming just posterior to the hamular notch or retromolar pad. Be careful not to overtrim and thereby remove the hamular notch or the retromolar pad. These are essential landmarks and must be preserved.

The anterior borders of the maxillary cast are formed by trimming from the canine area on each side to a point anterior to the interproximal area of the central incisors, being careful again to maintain the vestibule and the land area.

The anterior border of the mandibular cast is formed by creating a curving wall from the canine on one side to the canine on the other. The curve should be kept constant (ie, harmonious).

The tongue space of the mandibular cast must be trimmed flat, but the integrity of the lingual frenum, sublingual fold space, and the lingual sulcus must be maintained.

Laboratory Procedures of RPD framework fabrication

For successful construction of a removable partial denture, the dentist must provide dental laboratory personnel with the following:

- (1) a written work authorization describing the desired prosthesis
- (2) a design clearly drawn on surveyed master cast and on the prescription.
- (3) a master cast that provides an accurate reproduction of existing hard and soft tissue contours. (In NSU pre-Doc clinic, we do not articulate unless special occlusal determined by clinical faculty).

Steps of laboratory RPD framework fabrication

STEP 1 Verification the design on the master and the prescription

As soon as the laboratory receive, the technician must verify the prescribed design and the design on the master cast are identical.

STEP 2 Verify the tripod and the design of the master cast

The lab technician will place the master cast on the dental surveyor to verify the tripod marking indicates an acceptable path of insertion. This path should provide properly located survey line and undercuts.

STEP 3 Re-define the design on master casts

At this point, the laboratory technician will re-draw the design again on master cast strictly following the design principle: only the terminal 1/3 of the retentive clasp arm will engage the 0.01" undercut. Some RPD laboratory actually prefer to have the clinician draw the design on a separate cast (It could be a duplicate of the master cast), and the technician can transfer the design and draw cleanly on the master cast himself (or herself).

STEP 4 Cast preparation

Before the addition of the blockout wax, a maxillary cast is beaded.

Beading is the act of scraping the outline of the major connector into the master cast. The bead line is approximately **0.5 mm** deep and becomes less distinct as it approaches the gingival margins. The bead line produces a raised edge at the border of the major connector and ensures positive contact of the major connector with the palatal tissues. This feature reduces packing of food beneath the major connector.

Bead lines are not used in conjunction with mandibular major connectors because these connectors rest on thin gingival tissues that cannot tolerate the associated pressures.



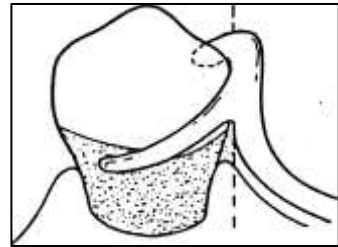
STEP 5 Blockout and Relief

"Blockout" encompasses certain procedures accomplished on the master cast which eliminate undesired undercuts or provide programmed spaces between the partial denture framework and tissue surfaces. Blockout is a laboratory procedure. An example of this would be in the

fabrication of an immediate interim partial denture. This could be made easy to insert if certain undercuts were blocked out on the cast beforehand.

The wax pattern for the framework will be made in the commercial laboratory on a refractory investment cast, which is a duplicate of the master cast. The refractory cast is made in a reversible hydrocolloid mold (impression) material. In our class exercise, the duplicate cast is made in an irreversible hydrocolloid (alginate) mold.

In order for a framework to seat in the mouth it must not contain ANY rigid components, which fit into undercuts of teeth and soft tissues. The tips of retentive clasp arms are the only partial denture components, which are engaged into undercuts and they, of course, are flexible - and the only flexible partial denture components. Thus, before the designed stone master cast is duplicated to form the refractory investment cast on which the framework pattern will be made, all undercuts adjacent to rigid parts of the framework must be eliminated (i.e. blocked out with wax) to eliminate the undercut. This will insure that any rigid component will cross the undercut without fitting into it. The material used for blockout is either the blockout wax that was supplied by the manufacturer of the surveyor and formulated for this specific purpose or a general purpose hard baseplate wax.



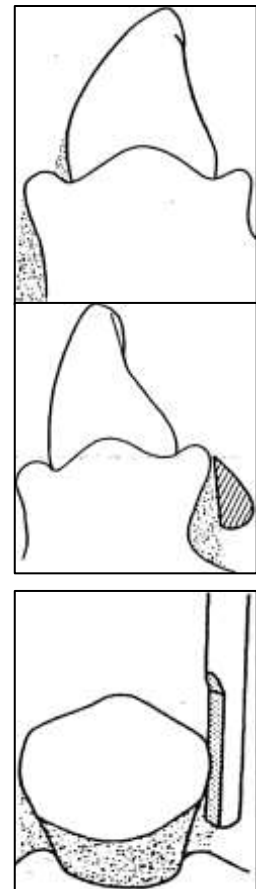
Types of Blockout

1. Paralleled Blockout

Blockout of all the teeth and certain undercut adjacent soft tissue areas is accomplished on the surveyor, parallel with the path of insertion. Using a #7 wax spatula heated in a Bunsen flame, an excess of blockout wax is flowed on each abutment tooth cervical to the survey line all around the tooth and right up to the survey line. In addition, blockout wax is flowed in tissue undercuts apical to the height of contour in all areas where a component of the framework, such as the minor connector of an I-bar clasp, crosses a soft-tissue prominence or where a major connector such as a lingual bar must cross a soft-tissue undercut, then, using the surveyor wax knife the wax is gently shaved away from all areas, including the guide planes apical to the height of contour (survey line).

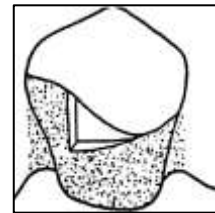
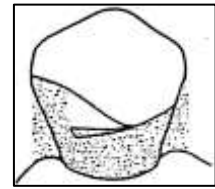
Trimming of the wax may be facilitated by heating the wax knife gently with a micro torch. The dentist or technician must be careful not to scrape away the stone surface of the cast as this would lead to subsequent discrepancies of the fit of the partial denture framework.

Other areas requiring paralleled blockout include wide interproximal embrasures which will be covered by minor connectors or lingual aprons and soft-tissue undercuts in all areas which will be crossed or covered by components of the removable partial denture.

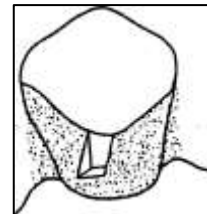


2. Shaped or ledged blackout

When the paralleled blackout has been trimmed to the survey lines, all undercuts on the abutment teeth will have been eliminated. It now becomes necessary to establish the undercuts for the tips of the retentive arms. This is accomplished using a #7 wax spatula for cutting away the blackout wax at the cervical border of the retentive clasp tip. This will expose the abutment tooth surface precisely where the undercut is .01 inch deep. If the clasp is a circumferential retentive one, the blackout wax removal is carried proximally toward the clasp origin following the drawn-in cervical border of the clasp. If the clasp is a reverse action type, the infrabulge wax is cut away from the tip as far back as the elbow of the clasp. Thus a horizontal right-angled ledge is produced in the blackout wax, deepest (.01 inch) at the retentive tip and fading away entirely where the retentive arm crosses the survey line. This ledge will be reproduced on the duplicated refractory cast and will precisely locate placement of the pattern for the retentive clasp.



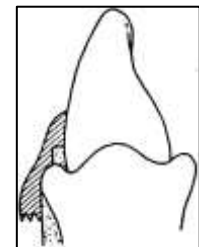
If desired, the ledge may be made more prominent and thicker by free-hand addition of extra blackout wax.



The end of the clasp tip area may also be precisely limited by the free-hand addition of a vertical ledge of blackout wax at the clasp terminus

If the clasp is an I-bar, the blackout wax is cut away only from the .01 inch undercut area to be engaged by the tip. The wax is cut away incisally or occlusally to the survey line to form a ledge no wider mesiodistally than the I-bar itself, namely a maximum of 1.5 mm

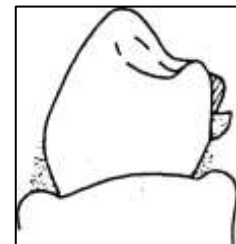
The ledge for the I-bar clasp may not be arbitrarily widened buccally as may that for the circumferential clasp, because the minor connector of the I-bar must be kept as close to the tooth and gingiva as the path of insertion dictates .



LEDGES may also be placed to locate non-retentive reciprocal or bracing clasp arms. In these cases, however, the blackout wax cervical to the height of contour is not cut away as it is for locating retentive clasp tips.

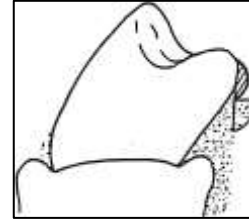
Instead, the ledge is formed occlusal to or on the survey line while following the design outline of the cervical border of the bracing arm.

The bracing arm should be as close as possible cervically to the height of contour (Survey line) .



In some cases, the survey line on the surface receiving a bracing arm may be so close to the occlusal surface that there is insufficient supra-bulge occluso-gingival height on tooth structure to accommodate the full width of the bracing arm. This occurs frequently when mandibular posterior teeth are tilted lingually or have excessive lingual prominence. In these instances it becomes necessary to fabricate the bracing arm with its cervical border not in contact with the tooth. Here, extra blackout wax is added to paralleled blackout to

form a ledge cervical to the survey line to help position the pattern for the cervical border of the clasp. (No part of the bracing arm can be in an undercut and the undisturbed paralleled blockout assures this) (Fig. 9). While it is most desirable that all clasp areas totally contact the tooth surfaces, it may be occasionally necessary to have only a portion of the width of the arm contact on or above the survey line.

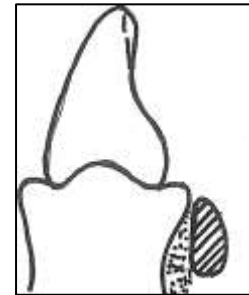


3. Relief

Wax called "relief" is placed on the master cast to create uniform programmed spaces between the soft tissues and the prosthesis. The tissue side of a major or minor connector may need relief to avoid impingement by the prosthesis as it rotates or settles during function, especially for distal extension partial dentures.

a. Lingual bar or lingual apron area relief.

Space must be provided under a mandibular lingual major connector because it can rotate inferiorly into the tissues during function. The shallower the slope of the lingual alveolar ridge, the greater the space that must be provided under the lingual major connector. A vertical lingual ridge or one that actually has an undercut filled in by paralleled blockout requires the least relief- in this case, a mere flash of wax is melted on the lingual ridge to provide relief.

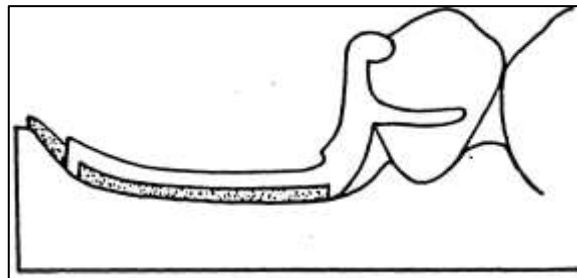


A very shallow-sloped lingual ridge requires maximum relief, usually provided by adding 28 gauge adhesive-backed relief or casting wax to the master cast.

A moderately shallow ridge requires somewhat less-thick relief such as 32 gauge relief wax. The relief wax applied to the cast should be wider than the major connector planned. A totally tooth-supported prosthesis needs little or no relief under the major connector.

b. Edentulous area relief.

Relief is also required to create a space for thickness of acrylic resin between the edentulous ridge surface and the portion of the framework used to retain the resin bases - either metal retention mesh or loops. Proper application of 20-gauge wax to the master cast over



the exact outline of the retention mesh of the framework will provide this space and ensure that the mesh will be located entirely within the acrylic resin.

For a distal extension framework, a 2 by 2 mm hole is cut in the relief wax over the center of the ridge at the distal border of the retention mesh. This will make it possible for a small part of the framework to contact the ridge crest at its distal end in the form of a small ridge-ward projection called a tissue stop. This tissue stop

will stabilize the distal end of the retention mesh which everywhere else will stand away from the ridge surface by the thickness of the 20-gauge wax. Tooth-supported edentulous areas also need 20-gauge relief for the retention mesh, but no tissue stop is required.

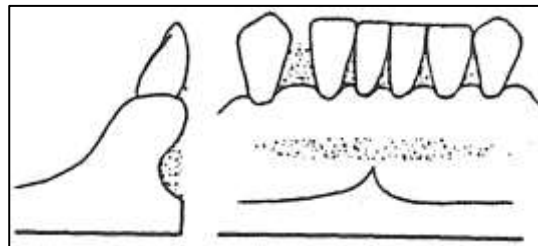
c. Other soft tissue relief.

Relief must be provided between major connectors and areas of bony prominences covered by thin soft tissues, such as tori. The degree of prominence of the anatomical irregularity and the expected amount of framework movement determine the amount of relief to be added to the master cast. It may range from a flash of wax melted on by spatula to 32 gauge applied over an outline of the relief area. This is true for maxillary as well as mandibular major connectors.

4. Arbitrary Blockout

For convenience in duplicating the master cast, some undercut areas not related to the framework are blocked out. These include areas of gross tissue undercuts such as the retromylohyoid areas of a mandibular cast, buccal and labial undercuts of soft tissues and teeth, and large interproximal embrasures. These areas are blocked out with heat-softened hard baseplate wax or modeling clay, which is then made smooth but without the necessity to use a surveyor.

In addition, all gingival crevices either crossed or covered by any part of the partial denture are blocked out by flowing into them with the spatula a thin flash of melted wax. This prevents impingement by the partial denture on the marginal gingivae and sulci.



Differentiation Between Parallel Blockout, Shaped Blockout, Arbitrary Blockout, and Relief.

	Site	Material	Thickness
Parallel Blockout	Proximal tooth surfaces to be used as guiding planes	Hard baseplate wax or blockout material	Only undercut remaining below contact of the surveyor blade with tooth surface
	Beneath all minor connectors surface	Hard baseplate wax or blockout material	Only undercut remaining below contact of the surveyor blade with tooth
	Tissue undercuts to be crossed by rigid connectors	Hard baseplate wax or blockout material	Only undercut remaining below contact of the surveyor blade with surface of the cast
	Tissue undercuts to be crossed by the origin of bar clasps	Hard baseplate wax or blockout material	Only undercut remaining below contact of the surveyor blade with surface of the cast
	Deep interproximal spaces to be covered by minor connectors or linguoplates	Hard baseplate wax or blockout material	Only undercut remaining below contact of the surveyor blade with surface of the cast
	Beneath bar clasp arms to gingival crevice	Hard baseplate wax or blockout material	Only undercut area involved in attachment of the clasp arm to the minor connector
Shaped Blockout	On buccal and lingual surfaces to locate plastic or wax patterns for clasp arms	Hard baseplate wax	Ledges for location of reciprocal clasp arms to follow height or convexity so that they may be placed as cervical as possible without becoming retentive
			Ledges for location of retentive clasp arms to be placed as cervical as tooth contour permits; point of origin of clasp to be occlusal or incisal to height of the convexity, crossing the survey line at fourth terminal, and to include undercut area previously selected in keeping with flexibility of the clasp type being used
Arbitrary Blockout	All gingival crevices	Hard baseplate wax	Enough to just eliminate gingival crevice
	Gross tissue undercuts situated below areas involved in the design of denture framework	Hard baseplate wax or oil-based clay	Leveled arbitrarily with a wax spatula
	Tissue undercuts distal to the cast framework	Hard baseplate wax or oil-based clay	Smoothed arbitrarily with a wax spatula
	Labial and buccal tooth and tissue undercuts not involved in denture design	Hard baseplate wax or oil-based clay	Filled and tapered with spatula to within the upper third or crown
Relief	Beneath lingual bar connectors or the bar portion of the linguoplates when indicated	Adhesive wax sealed to the cast; should be wider than the major connector to be placed on it	32-Gauge wax if the slope of the lingual alveolar ridge is parallel to the path of placement; 32-gauge wax after parallel blockout of undercuts if the slope of the lingual alveolar ridge is undercut to the path of placement
	Areas in which major connectors will contact thin tissue, such as hard areas so frequently found on lingual or mandibular ridges and elevated palatal raphes	Hard baseplate wax	Thin layer flowed on with hot wax spatula; however, if the maxillary torus must be covered, the thickness of the relief must represent the difference in the degree of displacement of the tissues covering the torus and the tissues covering the residual ridges

Altered Cast Impression Technique for Distal Extension Removable Partial Dentures

Rationale

When occlusal forces are applied to a tooth-tissue–supported removable partial denture, these forces must be equitably distributed to the abutments and the tissues of the ridge. This cannot be accomplished on a master cast made from a single impression. Instead, a dual impression technique is used in which a “corrected cast” is generated. The impression of the teeth is made with a material that captures the teeth in their anatomic positions. In contrast, the impression of the residual ridge must record the soft tissues in their functional form. Therefore, the impression of the residual ridge must

- (1) record and relate the tissues under uniform loading,
- (2) distribute the load over as large an area as possible, and
- (3) accurately delineate the peripheral extent of the denture base.

Indications

In some mouths, soft tissue displacement is slight. As a result, the functional and anatomic contours of the ridge may be virtually identical.

The altered cast impression technique is most often indicated for mandibular distal extension applications because only a limited ridge area can be used as a stress-bearing site. It is more difficult to obtain the proper peripheral extension of the mandibular denture base than it is to perform this same procedure for a maxillary denture base. This is primarily due to the mobility of the floor of the mouth.



The maxillary distal extension ridge is usually covered by a firm, well-attached mucosa. The stress-bearing area can be obtained in the same impression of framework fabrication. Altered cast impression usually is not indicated. Except extra-long span anterior edentulous base (normally including at least the six anterior teeth), where the ridge must supply some support for the prosthesis. Improving the accuracy of the cast with a secondary impression and defining the peripheral extension of the anterior flange can be helpful in distributing forces that act against a weaker portion of the dental arch.

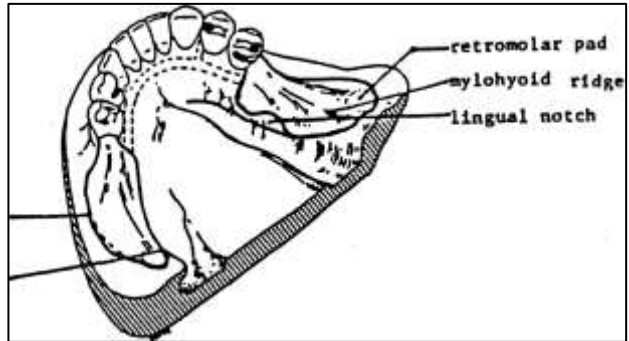
STEPS

I. TRAY FABRICATION

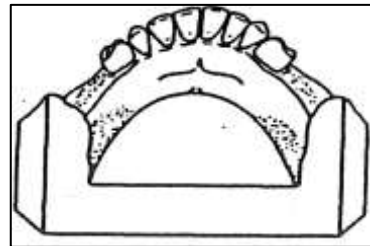
A. Armamentarium

1. Removable partial denture framework and master cast
2. Pencil
3. One sheet of pink baseplate wax
4. Bunsen burner and #31 wax spatula
5. Vaseline or Triad model release agent
6. Triad tray material or record base material
7. Acrylic trimming burs
8. Bard-Parker knife with #25 blade
9. Triad air barrier.

The tray extension is outlined on the master cast in pencil approximately two millimeters short of the maximum support area. This will clearly delineate the peripheral limits of the impression tray. An under-extended tray must be used in order not to interfere with the modeling compound recording of the functional movements of the border tissues.



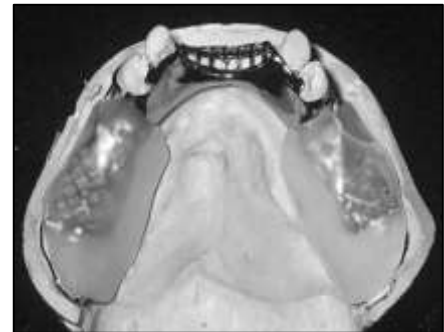
On the mandible, the tray will extend to within 2 mm of the periphery of the buccal shelf and retromolar pad. Vertically, downwards from the pad the extension will extend two millimeters below the mylohyoid crest. Lingually in the first molar area, a gently curving "notch" is drawn to accommodate the vertical movement of the sublingual gland and the horizontal movement of the tongue. On the maxilla the extension should be drawn two millimeters short of the buccal pouch and hamular notch regions.



The impression tray is made of Triad but first the undercuts in the edentulous ridge areas of the cast must be blocked out to permit the partial denture framework and the distal extension impression bases to be removed from the cast. Undercuts are frequently found lingual to the retromolar pad areas, but may occur anywhere, even just below the crest of the edentulous ridge. All these undercuts are blocked out with melted pink baseplate wax applied to the cast with a hot #31 wax spatula.

The distal extension edentulous ridges of the cast and the wax in the undercuts are coated lightly with Vaseline to help prevent adhesion of the Triad to the cast. Now fully seat the framework on the cast. The tissue stop(s) should be in contact with the cast.

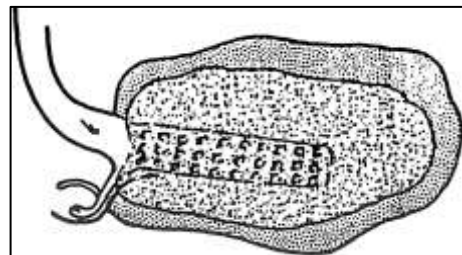
Cut a piece of Triad blue impression tray or pink record base material large enough to cover the outlined distal extension edentulous area(s).



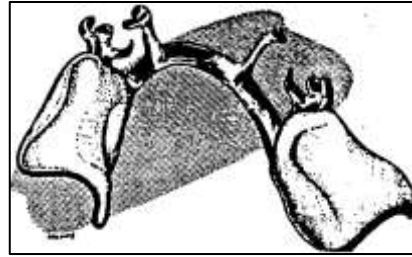
The Triad is firmly placed into the retentive meshwork and then evenly adapted to the drawn-in peripheral borders so that a properly extended tray not more than one to one and one half millimeters in thickness is obtained. The Triad should be gently trimmed to the borders with a sharp knife. Cure the Triad 2 minutes on the cast in the Triad curing unit, then remove the RPD framework from the cast.

After the initial cure of the Triad, the framework and tray are gently removed from the cast. The wax in the undercuts is removed from the tray.

Now, paint all surfaces of the tray with Triad air barrier and place in the curing unit tissue side up. Cure for another 2 minutes. The borders of the tray are trimmed with acrylic resin trimming burs



and finished by lightly polishing with pumice. This tray must simulate as closely as possible the borders of the denture base, both in the final extension and thickness. The extensions of the tray that will be subsequently obtained with modeling compound are only refinements of the previously determined extensions for the base.



II. Making the Impression

A. Armamentarium

1. Partial denture framework
2. Acrylic trimming burs
3. Micro torch
4. Green stick modeling compound
5. Water bath at 140 degrees F and cold water in a plaster bowl
6. Vaseline
7. Glass slab and 2X2 sponges
8. Regular bodied rubber base impression material
9. Bunsen burner
10. Bard-Parker knife with sharp blade
11. Color transfer applicator

B. Technique

1. Checking tray extension

The predetermined tray extensions must be checked in the mouth for over or under-extension. The determination of the support and stability areas is made by careful examination of the movement of the musculature adjacent to the edentulous areas, the type and tonus of the muscles, the quality of the soft tissues covering the edentulous ridge, and the feasibility of using certain support and stabilizing areas, given the existing anatomical topography of the patient.

The limits of the buccal extension on the mandible are checked by again tugging gently outward on the lips and cheeks while examining for any possible impingement on the tray. It must be noted, however, that the base should be extended out to the external oblique line but not beyond it. Fibers of the buccinator frequently cover the buccal shelf up to the crest of the ridge and thus may appear to impinge on the borders of the tray. These fibers run generally in an antero-posterior direction and, in function, rarely cause dislodgement of the denture. It would be a mistake to trim the tray extension without first asking the patient to make some functional movements of the lips and cheeks. Twisting the lips and cheeks, "making faces," sucking, and swallowing are movements that the patient should be asked to make. If uncomfortable impingement or displacement of the prosthesis occurs during these movements, the borders may have to be reduced.

The retromolar pad area of the tray can be checked by having the patient open and close the mouth slightly while visually examining the area just superior to the retromolar pad. A fold usually appears at the junction of the moving and non-moving tissues of the pad. When the mouth is open, the fold is stretched like the pleat in a pair of pants or skirt. When the mouth is closed, this pleat disappears. Extending the denture into or beyond this fold would likely cause discomfort and so should be avoided. This fold should be marked with a color transfer applicator and then, after inserting the tray and framework, pressure should be put on the posterior portion of the tray to transfer the mark at the maximum posterior extension of the pad onto the undersurface of the tray. The tray should be reduced two or three millimeters anterior to this mark to allow for border molding with compound.

The posterior portion of the lingual sulcus is known as the retromylohyoid fossa. This potential space is called such because of its boundaries. The posterior limit of the fossa is a curtain of tissue connected to the medial wall of the mandible; it contains fibers of the superior pharyngeal constrictor and attaches to the palatoglossus muscle on the postero-lateral border of the tongue. This limit can be felt, digitally when the patient protrudes the tongue. At the same time that the posterior limit of the fossa is examined, the inferior border that is limited by the mucosa of the floor of the mouth can be noted. The sharpness of the mylohyoid crest and the amount of the undercut below the crest should also be felt.

Anterior to the retromylohyoid fossa the mylohyoid muscle will be elevated when the tongue is protruded and thus the depth of the lingual sulcus will be decreased from the resting tongue position. Also, as the tongue is moved from side to side, the floor of the mouth tends to elevate slightly more in the first molar area. In this first molar area as well, the tail of the sublingual gland will be forced upwards as the mylohyoid is contracted. This elevation can be felt during the side-to-side and protrusive movements of the tongue. These functional movements of the tongue and the position of the sublingual gland should produce an area in the tray called the lingual notch.

2. Border molding

Modeling compound is most easy to use if it is plastic but not uncomfortably hot. The heat produced by a moderate Bunsen burner or microtorch flame is best for softening the compound thoroughly without melting it. Moving the compound back and forth over the flame, while gently rolling it with the fingers, is the best way to soften enough compound to work with. As the slightest drooping of the stick begins to occur, it should be placed on the previously dried flange of the tray. It can then be shaped somewhat with moistened fingers, flamed with a micro torch and tempered in the water bath before placing in the mouth. After applying the softened stick compound to the tray, the unused portion should be laid on a glass slab where it will cool without sticking.

The retromolar pad is the first area in which the compound should be placed. This will provide a firm stop posteriorly for the rest of the border molding and also describe the posterior extent of the denture. Making the final limit of the buccal shelf extension should be done by gently massaging the cheek to move the compound to a minimal extent. Alternatively, the patient may be asked to "make faces" or suck on a finger so that a functional limit to the denture can be made.

The masseteric notch region can be registered by asking the patient to contract the masseter by "tightening the lower jaw." This action will produce constriction of the masseter which in turn will push the buccinator anteriorly:- medially in the area just lateral to the retromolar pad. The soft compound will be displaced and a shallow notch very often can be discerned.

Border modeling of the lingual sulcus seems to provoke the greatest frustration to most practitioners. Yet it can be done easily by allowing the patient to do ninety percent of the work. Immediately after seating the framework-tray in the mouth, soft compound should be forced with the fingers into the retromylohyoid fossa. The patient is asked to protrude the tongue and then rapidly to move the tongue from side to side and then to the roof of the mouth. The protrusive movement of the tongue will displace the compound to the functional limits of the retromylohyoid fossa and the side-to-side and elevated movements of the tongue will create the lingual sulcus.

The movements of the tissue against the compound should create a fine, patina-like surface on the compound. If the compound is shiny or if finger prints or an uneven surface result, the compound should be resoftened in the Micro torch flame, tempered, and the movements tried again. When border molding is complete, all compound extruded or to the tissue surface of the tray should be removed with a sharp Bard-Parker knife. Likewise, excess compound on the outer surface of the tray should be trimmed away. The resulting tray should have the thickness and configuration of a denture base and compound should cover only its borders.



3. Wash impression

The final tissue impression is made with regular body rubber base. The tray must not be overloaded, but at the same time sufficient material should be used to make the impression. Loading the tray half-full using a cement spatula and then pushing some of this material to the borders should be sufficient for most impressions.

The tray-framework is quickly placed in the mouth and all rests seated completely. Take great care to avoid getting impression material on the abutment teeth. Seating the rests is of absolute importance. Equally important is that no pressure should be placed on the tray. Hands off the tray! Pressure on the rests! If there is one place in the making of the altered cast impression technique where error can occur, it is here. If the rests are not seated, the relationship of the tissue surface to the rest will be inaccurate. If pressure is placed on the tray, the rests will be rocked out of their rest seats and thereby create another inaccurate relationship between the tissue surface and rest seats. The tissue surface and rest seats must be properly related. If not, all work done to this point will be worthless. Some border molding of the wash material should be made when the material reaches a semi-set stage. Gentle massaging on the lips and cheeks for the buccal extensions, and protrusion of the tongue for the lingual extensions are all that is needed.

After the material has set (8 to 10 minutes), the impression is removed and disinfected. All flash is then trimmed with scissors. If impression material covers the rest of the adjacent abutment teeth, the impression must be remade. Any thickness of material here is evidence that the framework was not firmly seated. However, some impression material will exist around the retentive and bracing arms and in the undercut below the guide plate, yet here it is innocuous. This material and any flash of material on the major connector or beyond the retromylohyoid fossa can be removed gently with sharp scissors or a scalpel.



III. Altering the Cast and Pouring the Impression

A. Armamentarium

1. Cast and Impression
2. Saw or large cutting disk and mandrel for straight handpiece
3. #6 straight handpiece round bur
4. Sticky wax and #7 spatula
5. Caulking rope and boxing wax
6. Plaster bowl and spatula

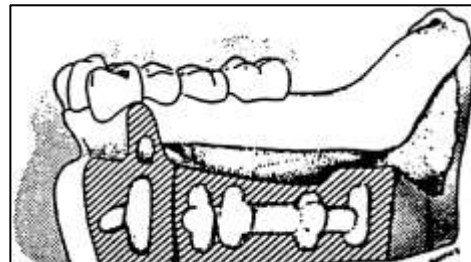
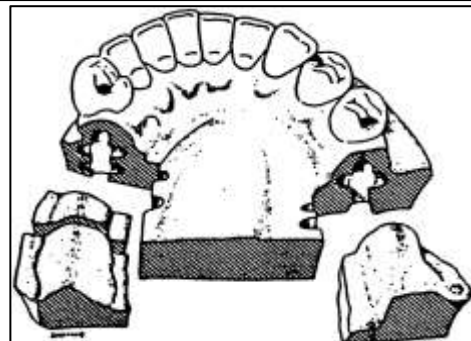
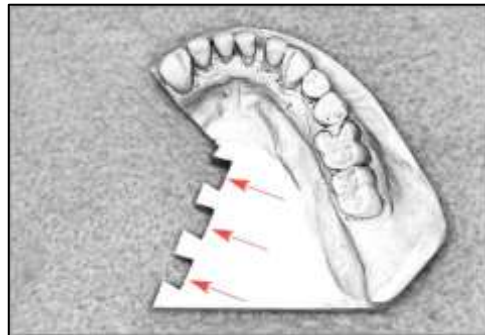
B. Technique

Before the impression is poured, the distal extension edentulous areas of the master cast must be removed. Either a saw or large cutting disk may be used. A cut should be made approximately one millimeter from the most posterior abutment through the residual ridge to the base of the cast. Another cut in the lingual sulcus area to join the anterior cut will be sufficient to remove the edentulous area. Retention grooves in the remaining anterior and lateral portions of the cast are made with the #6 round bur. Make enough horizontal and vertical grooves to mechanically retain the about-to-be-poured new edentulous region because there is no chemical cohesion between new and old gypsum.

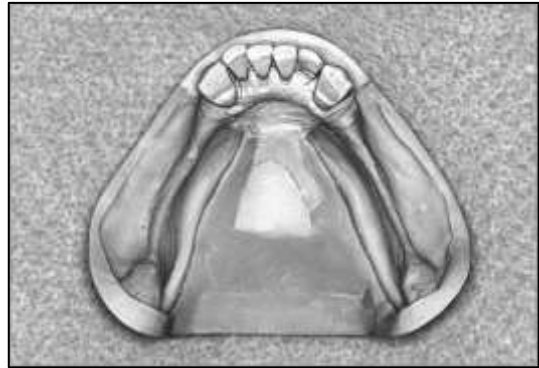
After the distal edentulous portions of the cast are removed, tentatively seat the framework and corrected ridge impression on the cast. No part of the new impression should touch the cast because this will tend to displace the framework. Using a sharp knife, trim the cast wherever it contacts the impression.

The framework must then be firmly secured to the master cast. This is the second place in the altered cast technique where error can occur that will make the whole exercise fruitless. The major connector, rests, retentive and bracing arms, and minor connectors, must all be secured to the dry cast with sticky wax. If the framework is not secured in place, dislodging of the framework may occur while pouring the cast. If this happens, the tissue surface of the base will not be properly related to the rests and relines of the denture will be needed.

Thoroughly dry the cast, framework and impression. After securing the framework to the cast, place two layers of rope wax around the dry periphery of the impression. The impression is then encircled with the boxing wax.



With sticky wax, fill all the gaps between cast, impression and rope and between caulking rope and the boxing. Before pouring Microstone into the impression, the master cast should be placed in cold water for half a minute or so. This is to wet the cast so that water will not be drawn from the newly added stone. An improper water-powder mixture at the junction of the old and new parts of the cast will create a weakened joint which might fracture during processing.



After the altered cast has set, the boxing materials are removed and the framework-cast assembly is placed in hot water to soften the sticky wax and compound so that the framework may be removed from the cast without too much difficulty. After removing the framework, the impression material is stripped out prior to separating the tray from the framework.

The framework is held with a pair of small pliers and the Triad tray is heated over a flame. As the tray begins to bubble, it is gently removed by grasping it with pliers and twisting slightly.

If the framework-impression initially resists easy removal from the cast, it should not be forced, because it is easy at this stage to destroy the cast by fracturing teeth from it. Instead, the Triad of the impression trays will have to be removed from the framework while the framework still remains in place on the cast. To do this, first remove all impression compound from the tray borders by softening these areas in hot water and peeling them away. Dry the entire assembly, then heat the tray resin of the right or left side with the concentrated flame of a Micro torch until the plastic softens and just begins to bubble. At this moment, grasp the softened plastic with pliers or get a knife blade under it, and peel it away from the framework and cast. If the plastic cools and hardens before it is free of the framework, it will have to be re-heated. When the Triad of one side has been removed, repeat the process, if necessary, on the other side so that the framework is unencumbered by anything that will resist its gentle removal from the cast. Now examine and clean up the altered cast.

IV. Adjusting the Tissue Rest

A. Armamentarium

1. Tin-foil substitute (Alcote)
2. Self-curing acrylic resin powder and liquid
3. Two dappen dishes and small paintbrush

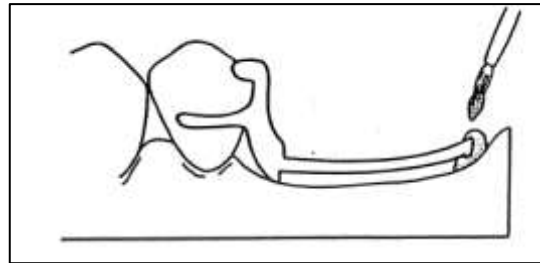
Frequently, when the framework is seated on an altered cast, the tissue rest will not contact the edentulous ridge as it did on the original unaltered cast. The reason is that the more viscous impression material of the corrected ridge impression, confined as it is by an accurately-fitting, border-molding plastic base, has compressed the edentulous mucoperiosteum. The original alginate impression recorded the ridge in a passive unloaded condition. The compression of the soft tissues over the distal extension edentulous ridge is desirable and intended to exert on the ridge the same kind of functional force it would experience during mastication. In this way the edentulous ridge shares the supporting function that would otherwise have to be totally provided by the periodontal

ligament of the distal abutment tooth. Functional forces applied to the denture teeth of the distal extension base made on an unaltered cast would then displace the soft tissues downward and considerable torque would be applied to the distal abutment.

The space between the tissue rest and the distal edentulous ridge of the altered cast should be corrected with self-curing resin. If it is not and the space under the tissue rest remains, the distal part of the framework will either flex toward the ridge during subsequent packing of acrylic resin, or the entire framework will be displaced from its proper position on the abutment teeth. The resulting partial denture after processing will rock in the mouth and the occlusion of the denture teeth will be premature, thereby necessitating considerable occlusal adjustment and a denture base relin.

B. Technique

Paint separating medium on the cast in the area under the tissue rest. Hold the framework firmly on the cast, then, using the small brush dipped alternately into the resin liquid and powder add small increments of GC pattern resin on and under the retention mesh and tissue rest. Fill the space between the tissue rest and cast over an area of 3 X 3 millimeters. Take great care to maintain the abutment rests in their fully seated position and avoid pressure on the tissue rests. After curing, this new resin tissue rest remains on the framework permanently, eventually becoming incorporated in the denture base.



V. Registration Bases and Rims

A. Armamentarium

1. Pink baseplate wax
2. Sticky wax
3. #7 and #31 spatulas
4. Bunsen burner

B. Technique

Registration bases are now easily made, they are made entirely of baseplate wax. First, melt sticky wax onto the framework retention mesh. Then create a soft rectangle of baseplate wax by thoroughly softening the end of a sheet of the wax in the flame and folding it upon itself two or three times. The small rectangle can easily be pressed onto the retentive framework and extended to the borders of the altered cast surface to form the registration base.

Another small wax rectangle can be similarly made and then placed to form the wax occlusion rims on the registration base. Mandibular rims should extend from the marginal ridge of the most posterior abutment tooth to the middle of the retromolar pad on the mandible. Maxillary rims extend from the distal marginal ridge of the most posterior abutment to the tuberosity and are about 2mm higher than the tuberosity.

Selecting and Arranging denture teeth of RPDs

1. Occlusal analysis and Selection of Prosthetic Teeth.
2. Approximate Wax-up of Tooth supply.
3. Selective Grinding of Tooth Supply.
4. Review of the Desirable contact Relationships for the RPD opposing the Natural Dentition.

1. Occlusal analysis and Selection of Prosthetic Teeth.

Diagnostic casts will be mounted on a semi-adjustable articulator with a facebow. When a sufficient number of remaining teeth exists the mandibular cast is mounted in centric occlusion (maximum intercuspal position or MIP). When the number of remaining teeth prevents this, as in Kennedy's classification I situations, the mandibular cast is mounted in centric relation (retruded centric position, or CR).

The opposing natural dentition should have an even plane of occlusion. If there is an extruded tooth projecting beyond the plane, it should be corrected and a new alginate impression made before wax-in of the tooth supply. This should be identified in your original treatment plan.

Tooth Selection:

A. Cuspal Inclination:

Opposing unworn natural dentition, the 30 degree cuspal inclination of Pilkington-Turner anatomical teeth is generally chosen. The occlusal surfaces are customized by selective grinding after the wax-in.

B. Mesio-distal dimension:

With the millimeter ruler measure on the cast the available mesio-distal space. Measure from the distal of the most posterior tooth to where the distal of the last prosthetic tooth will be.

C. Length:

Choose the occlusogingival length according to the amount of interocclusal clearance space available.

The choices are:

- a. S- short
- b. M- medium (most common choice)
- c. L -long

D. Material: Acrylic resin teeth are routinely used opposing a natural dentition.

E. Color: Harmonize color with the remaining natural dentition.

2. Arranging Denture Teeth

- A. The plane of occlusion and the Curve of Spee should be approximately aligned with the opposing arch. The mandibular denture teeth should not be placed on the sharp upper incline just anterior to the retromolar pad of the lower residual ridge. This would create a severe Curve of Spee not in harmony with the opposing dentition.

- B. Posterior teeth should be placed so that they are in approximately the correct position relative to the opposing arch. The buccal cusps of the mandibular teeth should oppose the central fossae of the maxillary arch. The palatal cusps of the maxillary teeth should be opposite to the ridge crest of the mandibular arch (and in the central fossae of the mandibular teeth).
- C. Cusp tips should be in alignment mesiodistally. Maxillary and mandibular cusp tips should not be directly opposite each other. Viewed from the buccal surface, maxillary cusp tips should be opposite intercuspal embrasures of mandibular teeth and vice versa.
- D. The length of the teeth occlusogingivally should be about the same or slightly less than the canine.

3. Selective Grinding of the Tooth Supplied: With burs and articulating paper, the occlusion is refined at this stage.

- A. Selectively reduce the prosthetic teeth until all the teeth are in contact in centric occlusion (MIP) and the incisal pin of the articulator is again in contact with the incisal guide table.
- B. The supporting cusps of the natural teeth must fall on marginal ridges or some horizontal or created horizontal surface in the central fossae of the prosthetic teeth.
- C. Remove any premature contacts that occur in lateral or protrusive excursions.

4. Desirable Contact relationships for the RPD opposing a natural dentition.

- A. There should be bilateral, simultaneous, even contact of all the teeth (prosthetic and natural) in centric occlusion (MIP), except in those rare instances where the occlusal vertical dimension is intentionally being increased by means of the prosthesis.
- B. In centric occlusion (MIP), the remaining natural teeth that are in contact before insertion of the RPD must remain in contact after insertion of RPD.

DO NOT DISCLUDE THE PATIENT'S NATURAL DENTITION WITH THE PROSTHETIC TEETH.

- C.
 - 1. There should be no non-working side contact of the denture teeth.
 - 2. There may or may not be cross-tooth working side contact of the denture teeth.
 - 3. The natural teeth should disclude the denture teeth in a protrusive movement.
 - 4. The natural teeth may disclude the denture teeth in lateral excursions. The denture teeth must never disclude the natural teeth in excursions.

Goal - The partial denture occlusion should harmonize with the remaining natural teeth for the preservation of the remaining tissues.

RPD INSERTION

During the many clinical appointments required to fabricate a removable partial denture, the practitioner should educate the patient about the goals and benefits of the therapy. The patient should understand that the principal goal of prosthodontic therapy is not merely the replacement of missing teeth, but preservation of the remaining dentoalveolar structures.

Objectives of the insertion appointment are :

STEP 1. to evaluate and correct the fit of the denture base,

STEP 2. to correct the occlusion, and

STEP 3. to adjust the retentive clasps.

STEP 4. to provide verbal and written instructions regarding appropriate oral hygiene, removable partial denture hygiene, and the need for future evaluation and maintenance.

Step 1: Tissue surface adaptation

A. Removing gross undercut

In the Retromylohyoid fossa areas, mandibular RPD flanges tend to engage too much into the soft tissue undercut. Shorten the distolingual extension, if necessary, to allow the RPD to be seated in the path of insertion.

Maxillary RPD with severe undercuts in anterior ridge or lateral surface of tuberosity could also encounter similar problems. The extension of flanges should be reduced to allow insertion and removal in the same path as the

B. Pressure indicating paste:

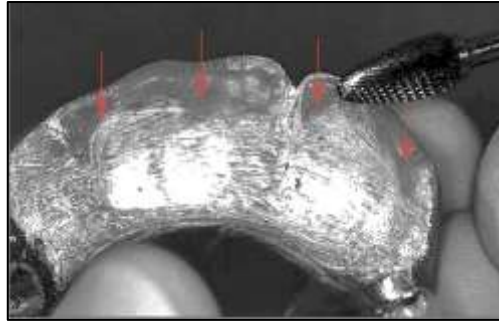
The consistency of pressure indicator paste should permit application of a thin layer to the intaglio surface of the denture base with a stiff brush. The brush can be used to place a distinct stroke pattern in the paste. The removable partial denture is then inserted, firmly seated, removed, and carefully inspected.



Where no contact between the denture base and the soft tissues has occurred, the brush strokes will remain in place. Where moderate contact has occurred, the brush stroke pattern will be indistinct or obliterated. Where heavy contact has occurred, the pink denture base material will clearly show through the white paste. Areas of heavy contact should be relieved using appropriate rotary instruments.

C. Adjustment of overextended borders:

To clinically evaluate denture base flange extension, direct visual examination is the method of choice. Tissues of the cheek are moved apically, outward, and occlusally. In turn, these tissues are moved anteroposteriorly. As the tissues are being manipulated, the practitioner watches the soft tissues adjacent to the denture base. Tissue movement should not be restricted by a denture base, nor should it cause the prosthesis to be dislodged.



Step 2: Occlusal surface Adjustment

The goals of occlusal evaluation and correction during the insertion appointment are

- (1) maintenance of existing natural tooth contacts and
- (2) establishment of occlusal harmony in all centric and eccentric positions.

Intraoral adjustment

When adequate numbers of natural teeth present and maintaining the vertical and centric contacts of the articulation, direct intraoral occlusal adjustment can be accomplished by using articulating paper.

Extraoral adjustment (Remount)

The extraoral (or remount) procedure is indicated for patients with

- (1) removable partial dentures displaying long extension bases,
- (2) extension base removable partial dentures covering extremely mobile soft tissues, and
- (3) removable partial dentures opposed by conventional complete dentures.

For clinical situations in which compromised stability and support make occlusal evaluation challenging, remounting the denture or dentures on an appropriate articulator will permit more accurate occlusal evaluation and adjustment.

To remount removable partial dentures in an articulator, it is necessary to secure casts of both the dental arch restored by the removable partial denture and the opposing arch. An irreversible hydrocolloid impression is made with the removable partial denture completely seated in the patient's mouth. In most instances, the prosthesis will remain in the impression when the impression is removed from the mouth.



If the prosthesis remains in the mouth, it must be retrieved and carefully repositioned in the impression. Undercuts within the removable partial denture are then blocked out using

baseplate wax, clay, wet paper towels, or wet facial tissues. Dental stone is mixed and vibrated into the impression. When the dental stone has hardened, the cast is recovered and trimmed in preparation for mounting procedures.

Maxillary cast should be mounted according to the facebow records. The mandibular pick-up impression cast should be mounted to the maxillary cast on articulator based on the need of the case.

Step 3: Clasp Adjustment

Clasp arms sometimes will get bent during the polishing process in the laboratory. Careful adjustment of the clasp arm will provide adequate retention and improve the acceptance of the prosthesis.

Once the RPD is properly seated, observe the adaptation of the clasp arms to the surface of the teeth. A mouth mirror can be used to view the adaptation of clasp from the occlusal view. The bracing arm should be in passive contact and retentive clasp terminus should stay in the retentive undercut area. Any separation of the clasp arms indicates the need of adjustment.

Wrought wire clasps are easier to adjust than the cast metal clasps. Bird beak or 3-prong pliers should be used following the same technique described in the interim RPD handout.

HOME CARE of Removable Partial Dentures

Home care and proper plaque control constitute the most important element of any restorative treatment, especially in the long-term success of removable partial dentures. Without plaque control measures on natural teeth and on surfaces of the partial denture, the treatment is destined to fail because of recurrent caries and gingival- periodontal disease. Both of these morbid conditions are even more likely to occur if a partial denture is worn and improperly cared for than if no partial denture is worn at all. Meticulous home care procedures can result in a disease-free mouth and comfortable and effective wear of the prosthesis for many years to come.

Daily duration of wear

Except in very specific unusual circumstances, removable prosthodontic appliances should not be worn 24 hours a day. Both the delicate soft tissues and the teeth in the vicinity of the partial denture will suffer: the soft tissues with inflammation and the teeth with increased susceptibility to caries. Continuous coverage of the oral mucosa prevents its exposure to the normal oral environment. This includes cleansing and massage by the tongue and contact with the saliva, both of which stimulate blood circulation that prevents stasis and inflammation. Saliva, in addition, has anti-caries activity and all the surfaces of the abutment teeth should be exposed to it for least part of the day.

A removable partial denture would therefore be out of the mouth for up to eight hours a day - the hours of sleep provide the most convenient interval. When out of the mouth, the prosthesis should be immersed in a solution of one of the popular commercial denture cleaners. Some people are reluctant to sleep

without their dentures in place and some adamantly refuse to do so for strongly- felt personal reasons. The dentist should stress to them the extreme importance of not wearing their prosthesis 24 hours a day for the long-term success of their treatment. These people should be advised to remove their partial dentures for at least several hours during the day: the interval between the evening meal and sleep is convenient for most if they are at home. No day should pass without the denture being out of the mouth for at least a couple of hours.

Patients who are known to reject or ignore this advice about non-continual wear, should be motivated to exert especially assiduous plaque control and cleaning procedures in an attempt to avert or postpone the consequences of this undesirable practice of 24-hour a day wear.

Plaque control

The natural teeth should be properly brushed and flossed after every meal or snack. There is no substitute for this in preventing caries and gingivitis and promoting oral health. Reliable plaque removal over the long term requires the periodic and regular use of disclosing media to identify areas that are not being effectively cleaned. Disclosing tablets such as Red Cote (Butler), used with the partial denture in the mouth will reveal plaque accumulations on the prosthesis wherever it occurs. Actual brushing and flossing, of course, must be done with the prosthesis OUT of the mouth.

If an occasional unusual situation makes it impossible for a patient to perform oral hygiene procedures after eating, the least the patient should do is to rinse the mouth vigorously with water and rinse the partial denture with copious cold running water in a sink. The patient should keep it in mind that he owes himself a proper oral hygiene session some time later that day - but definitely that day.

Cleaning the partial denture

Ideally, the removable partial denture should be mechanically cleaned with a brush, soap and water after every meal. Recommend use of a denture brush, such as the Lactona #500 denture brush. This brush has two heads, one for cleaning large flat surfaces and the other for cleaning inside ridge areas and the tooth-contacting metal parts of the partial denture. The brush should be used with sufficient vigor mechanically to clean away all food and plaque on all denture surfaces. Stress to the patient that the best cleansing medium is soap and water. Discourage the use of regular tooth paste on the partial denture.

Although its abrasiveness is slight, it is enough eventually to wear acrylic resin.

Patients who desire to use one of the denture cleaning pastes may do so, but it is an unnecessary expense.

Overnight, or during the hours the denture is out of the mouth, it should always be immersed in one of the popular commercial denture cleaning solutions such as Efferdent, Kleenite, Mersene, or Polident. Dentures should never be kept dry, as dehydration of the plastic can cause warpage. The denture and cleaning solution should be kept in a closed container dedicated to this purpose alone and well away from the reach of curious young children and marauding dogs. Many a denture has been

lost by children and as many chewed up by dogs. Although the rest of the world may laugh, neither of these not infrequent household tragicomedies is very amusing to the patient.

Patients should be warned against using sodium hypochlorite solutions such as Clorox as a soaking medium for removable partial dentures. It is quickly corrosive to chrome-cobalt alloy, even when diluted.

Calculus removal

Many patients experience copious or rapid salivary calculus formulation on their teeth and require prophylaxis more frequently than annually. These same patients tend also to accumulate calculus deposition on their removable dentures. They should be alerted to this likelihood at the time of delivery and at recall appointments if calculus is observed on the partial denture. These patients should be advised to leave their dentures in undiluted distilled white vinegar (a weak acid) one or two nights a month. The vinegar will either dissolve or soften the calculus (a deposition of mainly calcium salts) so it can be brushed away in the morning. The vinegar is innocuous to the plastic and metal of the partial denture and rinsing will dissipate the characteristic vinegar taste.

Mechanical aids

Some patients may be interested in purchasing one of the several subsonic or ultrasonic vibrating denture cleaning units currently on the market. These are labor saving gadgets for a procedure that at most requires a minimum expenditure of physical energy. Studies have confirmed that when used with the appropriate cleaning solutions, they are effective in removing plaque and calculus from the denture, but no more so than using the proper hand brushing techniques and cleaning solutions described above.

Some patients, either because of age, infirmity, debility or apathy, require mechanical help for cleaning their teeth and dentures. For them, it may be very helpful to recommend electric toothbrushes for cleaning their natural teeth and partial dentures and an oral irrigator (Water-Pik).

Neglect of adequate home care will inevitably lead to eventual failure of a partial denture (or rather of the teeth and soft tissues that support it). The conscientious dentist will spend whatever time is necessary to inform the patient of all necessary procedures and to motivate him to carry them out as a daily routine. He or she will furthermore assure the patient's efforts are adequate by asking the patient to demonstrate the actual methods used in brushing, flossing and cleaning the denture.

2016 CD MANUAL

CHAPTER 1

EVALUATION OF THE PATIENT DIAGNOSIS AND TREATMENT PLAN FOR COMPLETE DENTURES

In the construction of complete dentures, success or failure may depend upon a clear understanding of the limits and possibilities of each case. To obtain this, a thorough, systematic examination of all the conditions of the mouth and of the patient is essential.

The following outline will aid in completing the Complete Denture Diagnostic form and in evaluating the patient.

1. AGE

The significance of the age from the dentist's standpoint is in the ability of a patient to wear dentures successfully. Two main factors present themselves:

- a. Adaptability**
- b. Physiological Condition of Supporting Structures**
- c. General health condition**

2. GENDER

3. OCCUPATION

The occupation of an individual may demand special consideration in denture construction from the standpoint of esthetics, phonetics, or function.

4. GENERAL HEALTH

- The general health of an individual has a bearing on success in denture construction. This is especially so since many of these patients are at an age that general health condition might start to decline.
- Healthy patients can make a better adjustment than the ill, tense, nervous patient. Many diseases and the medications used to control the diseases might have significant oral manifestations. Some of the diseases causing pain or burning sensations may be anemia, diabetes, certain endocrine or nutritional disorders.
- Psychological disorder and stress from other aspects of life could also affect the patients' perception or change the threshold to stimuli.
- Caution should be exercised in the care necessary in denture construction

following radiation therapy in the region of the jaws or the patients who have undergone intravenous Bisphosphonate treatment.

- Some systemic conditions that could affect the clinical procedures(final impression, jaw relation registration) or regular denture care. For examples: diabetes, poor neuromuscular control, arthritis, stroke, head and neck cancer, Parkinson disease.

5. DENTURE HISTORY - DENTURE WEARING EXPERIENCE

The length of time and the fact that patients have worn dentures have a bearing on the type of foundation present, muscle tone and development, functional ability, mental reaction and cooperation and the correctness and ease of establishing vertical and maxillo-mandibular relations. The type of denture, whether full or partial, metal or plastic, may have either a beneficial or detrimental effect on the end results obtained.

The ease with which patients can establish new habits is important. A patient who has successfully worn dentures before might be easier to work with than one who has had several unattractive and/or inefficient dentures. The patient with a bag full of dentures are categorized as “refractory patients”. It is a modification factor in PDI. They usually present a bleak outlook. Register the complaints and problems of previous dentures. Examine old dentures and evaluate them for retention, stability, occlusion, extension, etc. If old dentures were completely satisfactory, use these as templates in terms flange extensions, dimension and arrangement of denture teeth.

6. MUSCULAR TONE

Usually normal when no degenerative changes have occurred in the muscles of expression and mastication, or in the tactile sense of the jaw and mucosa. A marked loss occurs from the absence of natural teeth or artificial dentures, or from wearing grossly inefficient dentures.

7. MOUTH OPENING

A large opening is ideal for impression making and other procedures. A small opening, especially if the ridge is large, can present problems.

8. LIP SIZE/COMPETENCY

A long lip minimizes tooth and gingival display and esthetics is less a problem. Short lips and strong peri-oral muscles require more attention to impression making, jaw relation records and tooth arrangement.

9. ARCH SIZE

Large jaws offer the greatest advantage for retention, stability and efficiency. Also, arch size provides a quick estimate of tooth size necessary. If arch size and face size are not in harmony, the esthetics may be a problem. A moderate amount of clinical experience will enable the operator to judge relative jaw sizes.

10. ARCH FORM

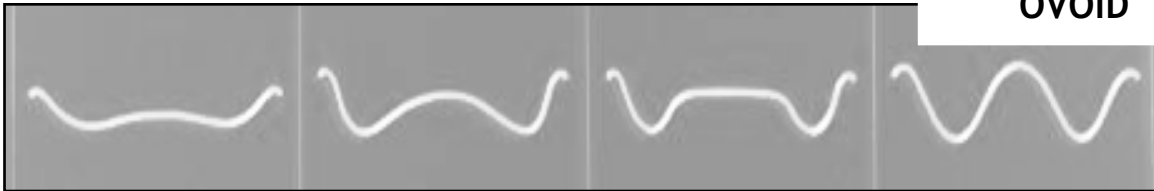
This classification is based on the outline form of the ridges in the horizontal plane as it suggests a square, tapering or oval form.

- A. The **SQUARE** type
- B. The **TAPERING** type
- C. The **OVOID** type

The square arch is more favorable for retention and stability. The ovoid is slightly less favorable and the tapering arch is the least favorable. factor has an influence on the tooth set-up and alignment.

11. VAULT FORM

The outline of the ridges and hard palate as seen in a frontal section of the maxilla in the region of the second bicuspid or first molar is observed from the standpoint of form, namely: square (rounded, arched, or "U"-shaped), tapering ("V" shaped) and gently curved or



flat.

A flat vault has good vertical support but provides no resistance to lateral shifts. A high (or "V" shaped) vault resists lateral shifts well, but vertical displacement tends to break the seal in all areas at once. A rounded or arched ("U" shaped) vault provides the most favorable prognosis and resists both vertical and lateral displacements.

The form of the palatal vault gives an indication as to the original form of the dental arch before removal of the natural teeth and resorption of the residual ridge. A

broad and shallow edentulous palatal vault indicates that the dental arch form originally may have been square; a high, V-shaped edentulous vault probably indicates a tapering dental arch, and a rounded vault of average height may indicate an ovoid dental arch. Most patients exhibit some combination of these classifications.

12. ALVEOLAR MUCOSA

Comparing to the 45-cm² area of periodontal ligament available in each arch natural dentition, the mean denture-bearing area is 22.96 cm² in the edentulous maxillae and approximately 12.25 cm² in an edentulous mandible.

The denture-bearing area (basal seat) also becomes progressively smaller as residual ridges resorb. Furthermore, the mucosa demonstrates little tolerance or adaptability to denture wearing. Masticatory loads are much smaller than those that can be produced by conscious effort and are in the region of 44 lb (20 kg) for the natural teeth. Maximum forces of 13 to 16 lb (6 to 8 kg) during chewing have been recorded with complete dentures, but the average loads are probably much less than these. In fact, maximal bite forces appear to be five to six times less for complete denture wearers than for persons with natural teeth.

In the initial patient evaluation visit, the health and quality of attached mucosa(mucoperiosteum) and the underlining alveolar bone should be examined. The clinician should palpate and visually inspect the peripheries and supporting area of the denture bases. In the edentulous person, the mucosa covering the hard palate and the crest of the residual ridge, including the residual attached gingiva, is classified as masticatory mucosa. Post palatal seal area also needs to be examined to ensure proper extension and seal.

14. Residual ridge morphology

The following factors should be noted in the intraoral examination. Decision of surgical correction needs to be considered due to the presence of these anatomical structures might make denture insertion and use difficult, painful or impossible:

a. Tuberosities

Large tuberosities provide good support and retention; however, they must be viewed with suspicion. If deep, bilateral undercuts are present they should be corrected with surgery. Extremely hypertrophic tuberosities that can interfere with the lower denture should be reduced. Flexible, fibrous area

overlying tuberosities affect stability and should be surgically excised. Also note the retromylar pouch (area bounded by the internal pterygoid muscle and coronoid process). Examine the retromylar pouch with the mouth open and again with the mandible swung laterally, testing whether the coronoid process approximates the tuberosity when the mandible moves laterally. A lateral reduction of the tuberosity may be necessary for the placement of the buccal flange.

b. Undercuts

- Undercuts along the buccal aspect of both ridges anterior to the tuberosity.
- Undercuts on the lingual side of the lower ridge surface, anteriorly or posteriorly.
- Undercuts at the site of recently extracted teeth-incomplete remodeling process of the alveolar bony eminence/ exostosis.

c. Tori

Palatal Torus

Not all tori require surgical intervention, unless they are large and bulbous or interfering the posterior palatal seal. The mucosa over a torus is usually thin and unyielding.

Mandibular Tori

Usually more of a problem as they interfere with the lingual border seal and restrict the tongue space. If prominent & with undercut, surgical correction is indicated.

d. Mucobuccal Fold

A low position (away from the crest) is most favorable for developing and maintaining a good border seal. High membranes and muscle attachments (near the crest of the ridge) are less favorable. Surgical corrections are possible but difficult and scarring and reattachment can occur.

e. Frenum Attachment

Are only significant if near crest of the ridge. Surgical correction is not difficult and sometimes desirable.

f. Ridge Form

Evenness of the ridge surface

A rounded and smooth ridge is the most favorable. Sometimes the ridges are studded with sharp protuberances due to sharp edges of the interseptal bone remnant. Irregular ridges with undercuts or sharp projections often require surgical correction.

Cross sectional form

A flat lower ridge is usually difficult but it can be managed if the patient has a favorable tongue position and a wide buccal shelf. Often relief is necessary for the mental foremen. The most difficult ridge is the thin knife-edged one, especially in the lower anterior and sometimes extending to the second molar areas on both sides. This is usually seen in a tapered arch with sharp mylohyoid ridges and narrow buccal shelves.

Redundant tissue

Redundant tissue may be found in the upper anterior ridge area, the upper tuberosity region the entire upper ridge from the first molar are on one side to the corresponding area on the opposite side and the mucobuccal fold area.

14. TYPE OF OSSEOUS STRUCTURE

Besides the quality of bone and arch form the quality of bone as disclosed in the radiograph may be considered. The amount and pattern of cortical bone and trabecular bone in the denture supporting area should be noted.

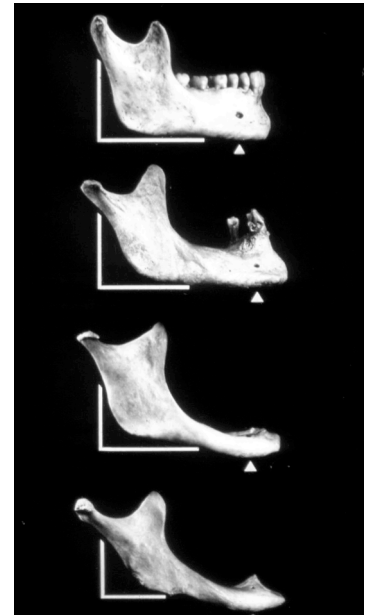
15. RESORPTION

A. Average resorption

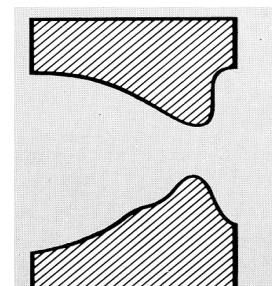
According to literature, ridge resorption occurs after extraction of the teeth. Mandibular ridges resorb at a rate that's 4 time faster rate than the maxillary ridges.

B. Excessive resorption

The ridges have little height, breadth, or bulk and the denture space is excessive. By virtue of this condition, all of the factors of denture construction and use are made most difficult.



16. RIDGE RELATION (Skeletal relationship)

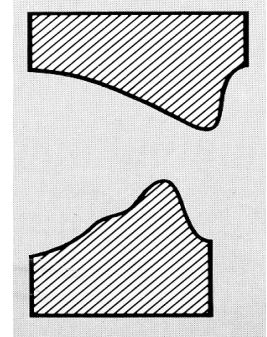


A. Class 1, Normal

The lower ridge crest is very slightly to the inside of the upper ridge crest. No difficulty is expected in the normal positioning of the teeth for proper support, for direction of stress application and for obtaining maximum esthetic qualities

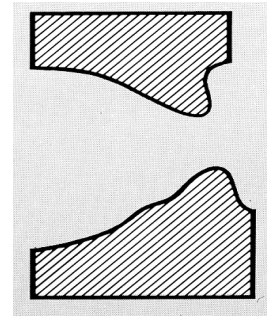
B. Class 2, Retrognathic

The lower arch is smaller than the upper and the lower ridge crest is inside the upper ridge crest considerably more than in the normal. Retrusive mandibular ridge are usually difficult to arrange a set-up for and look toothy. They often hold the mandible forward to improve appearances. They usually have a great range of jaw movements in function, require careful occlusion and often might require careful evaluation of the jaw relation registration.



C. Class 3, Prognathic

The lower arch is larger all around than the upper, hence the upper ridge crest is inside of the lower ridge crest. When this ridge relationship is restricted to one or both posterior regions or to the anterior region, it is a crossbite relationship. The positioning of teeth may follow an atypical arrangement. These cases are usually easier to arrange teeth for, if not extreme. They usually function on a hinge (little or no protrusive component) and require a minimum of interocclusal distance.



* Complex relationships

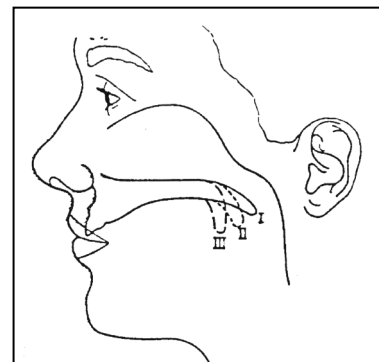
These relationships are mixtures of classes 1, 2 and 3. Unilateral crossbite or unilateral retrusive cases are those in which prognathic or retrusive relationships exist on one side only.

Ridge relation is better ascertained after the case is mounted on the articulator and the teeth are being set up. The relationship determined at the diagnostic stage is only a tentative one and must be substantiated at the set-up stage. Any change of the tentative diagnosis must be made in the EHR with the consent of the instructor.

17. THROAT FORM

A. Upper throat form

Throat form takes into consideration the post dam area which is that area between the vibrating line and the



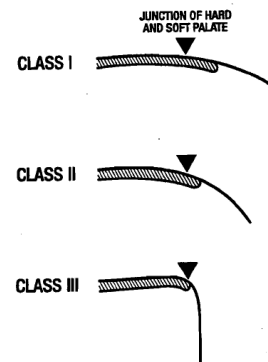
termination of the hard palate in the upper arch and retroalveolar area in the lower arch. A wider post dam area is more favorable for retention and is based on the throat form (after Dr. M. M. House).

Class I –

Large and normal in form with immovable tissue extending posteriorly from the hard palate for 5-12 mm. at which point the curtain of the soft palate makes an obtuse angle with the hard palate and becomes movable with a decidedly large range of movement. It is usually present in cases with a low palatal vault and small tuberosities. It is the most favorable post dam configuration.

Class II –

Medium and normal in form having immovable tissue approximately 3-5 mm posterior to the hard palate. It is usually present in cases of moderate length and sweep of the soft palate. The junction between the hard and soft palate is more acute than in Class I.



Class III –

Small with little or no immovable tissue posterior to the hard palate. Such cases usually present a small short tense soft palate forming the most acute angle at the junction with the hard palate of all classes. The angle approaches a right angle. This is the least favorable post dam configuration. Large tuberosities frequently are accompanied by a forward attachment of the tensor palatini muscle. One should test for displacability of tissue by palpating the post dam area with a blunt instrument such as a T-ball burnisher. Marked displacement is more favorable for good retention because a deeper posterior palatal seal can be used. Slight displacement (especially with a flat ridge) can present severe retention problems.

B. Lower throat form

The retromylohyoid area which constitutes the lower throat form governs the distal and inferior extension of the lingual denture flange. It may be diagnosed by palpating the area while the tongue is alternately relaxed and extended. By this means the relation of the tissue attachment to the ridge crest can be ascertained and described as:

Class I

Low - 1/2 inch or more from the mylohyoid ridge to the bottom of the retro-mylohyoid fold, visible when the tongue is in a slightly protruded position. Most favorable.

Class II

Medium - Less than 1/2 inch under the same conditions as above.

Class III

High - Retro-mylohyoid fold at same level as mylohyoid ridge. Least favorable.

18. MYLOHYOID AND RETROMYLOHYOID FORM

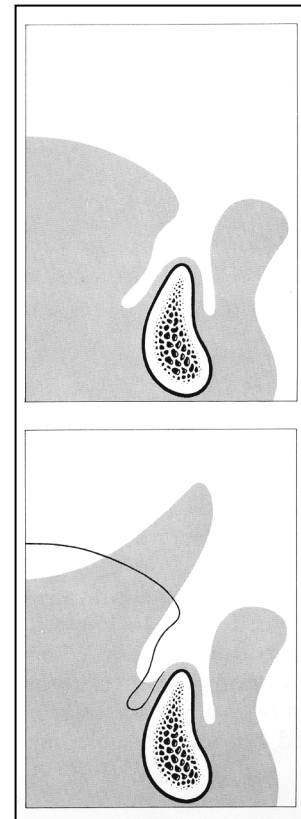
The mylohyoid and the insertion of a group of muscles in the retroalveolar area are examples of muscle attachments which affect denture flange outline. The primary distinction between muscle attachment and border tissue attachment is that muscle attachment always requires denture contour which provides freedom for physiologic movement. The muscles in the retroalveolar area govern the size of the space available for the distal inferior extension of the lingual flange.

19. VESTIBULAR MUCOSAL ATTACHMENT

Vestibular tissue attachment constitutes the tissues referred to as the mucobuccal and mucolingual reflections and comprises the superficial mucosa and the deeper parts formed by muscle fibers. Because tissues are freely movable they can be placed by impression techniques and may govern the extension of the denture flange.

The degree of movement is governed by the position of their attachment which is classified thus:

- A. Most favorable: the attachments are about 1.5 cm. distant from the ridge crest.
- B. Normal: the attachments are about .75 cm. distant from the ridge crest.
- C. Unfavorable: the attachments are about .25 cm. distant from the ridge crest.



20. PALATE SENSITIVITY - GAG REFLEX

This is evaluated by lightly passing the tip of a dull instrument over the vibrating line area. A slight or no response is favorable. Moderate gagging can be controlled by

careful denture procedures, counseling and even medication. Severe gaggers offer a poor prognosis and should be evaluated very carefully. Counseling and/or medication may also be indicated for the severe gagger.

21. TONGUE POSITION

These factors have much to do with the establishment of the lingual contour of the denture and its retention. It has a great influence upon the ease with which the patient becomes accustomed to its use. Normally, the tongue should be expected to rest in a relaxed position on the lingual flanges, which, if properly contoured, will allow the tongue to help retain the denture. A tongue thrust tends to dislodge a lower complete denture by raising the floor of the mouth and, in so doing, lifting the lingual flanges and by exerting pressure on the anterior teeth.

The retruded position (35% of the patients) causes poor prognosis of mandibular complete denture.

22. SALIVA

Normal amount and viscosity is the most favorable. Thin watery saliva may affect retention. Abundant saliva is common when the denture is first inserted but usually improves with time. Thick ropy saliva complicates impression-making and is annoying to the patient as it clings to the denture. Deficient saliva is usually seen in the geriatric patient and in certain systemic disorders and poses a poor prognosis for retention and comfort.

23. INTERMAXILLARY SPACE

If the ridges are both large, part the lips gently while the patient maintains a rest position and note if there is sufficient space for teeth. If the space is limited remember to use very thin base plates over the ridges and use acrylic resin teeth. A large inter-maxillary space is also unfavorable because the teeth sit so far above the ridge that undesirable tongue forces may be created on the ridges.

24. CLASSIFICATION OF MENTAL ATTITUDES

Mental attitudes are divided into four classifications. They are (according to Dr. M M House):

A. Class I - Philosophical

These patients anticipate the need for treatment with complete dentures and are willing to rely on the dentist's advice for diagnosis and treatment. Philosophical patients will follow the dentist's advice when advised to replace their dentures.

B Class II - Exacting

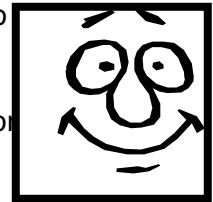
Exacting-mind patients are usually in poor health and need a great deal of treatment, but they are unwilling to accommodate suggestions from the dentist or physician to extract hopeless teeth and become denture wearers. Exacting-mind patients also doubt the dentist's ability to make dentures that would satisfy their esthetic and functional needs. Often, the exacting-mind patient demands extraordinary efforts and guarantees of treatment outcome at no additional cost.

C. Class III - Hysterical

These patients are neglectful of their oral health, dentophobic, and unwilling to try to adapt to wearing dentures. Although these patients may try to wear dentures, they often fail to use the prosthesis because they expect it to look and function like natural teeth.

D. Class IV - Indifferent

Those who are unconcerned about their appearance and feel very little or no necessity for teeth for mastication. Indifferent patients sometimes appears not to be interested about their treatment. But it could be a camouflage of exacting or hysterical personalities.



25. FACE FORM

Some prosthodontists believe that form and arrangement of the teeth should harmonize with face form. Although a pure type is rarely found, face forms may be classified as follows:



A. **Square:** in this case the face is about equally wide in the temporalis region, the area of the zygomatic arch and the angles of the jaw.

B. **Tapering:** A decrease in width is generally found in these types as one progresses from forehead to chin.

C. **Ovoid:** the area of the zygomatic arch is widest in this case.

26. RADIOGRAPHIC EXAMINATION

Panoramic radiographs are used to evaluate the quality and quantity of residual ridges. Any suspicious radiopacities or radiolucencies should be noted. Retained roots or impacted molars with no apparent pathology(after consulted with oral pathology) can often be left alone provided the patient is informed of their presence

and radiographic examination periodically. Panoramic radiograph should also be used in the measurement of the vertical height of the mandible as part of the Pdi classification criteria.

27. TMD SYMPTOMS OR PATHOLOGY

Inquire if there is pain in or around the joint and ear, difficulty in opening, clicking and crackling or any other problem in that area, currently or in the past. Palpate the TMJ area for tenderness. Look for midline deviations when the patient opens and closes and evaluate any limitations of movements which may complicate the recording of centric relation and the other positions. Crepitus may be present but it is not necessarily a cause for future denture difficulty.

28. ASYMMETRIES OR COMPLICATIONS

Note any asymmetries of the face that will complicate esthetics. Note any other complications such as anatomical or congenital abnormalities, poor speech, tics or spasms, etc.

Chapter 2

PROSTHODONTIC DIAGNOSTIC INDEX(PDI) OF EDENTULOUS PATIENT

The American College of Prosthodontists has developed a classification system for complete edentulism based on diagnostic findings. These guidelines may help practitioners determine appropriate treatments for their patients. Four categories are defined, ranging from Class I to Class IV, with Class I representing an uncomplicated clinical situation and a Class IV patient representing the most complex and higher-risk situation. Each class is differentiated by specific diagnostic criteria. This system is designed for use by dental professionals who are involved in the diagnosis of patients requiring treatment for complete edentulism. Potential benefits of the system include: 1) better patient care, 2) improved professional communication, 3) more appropriate insurance reimbursement, 4) a better screening tool to assist dental school admission clinics, and 5) standardized criteria for outcomes assessment.

Diagnostic Criteria for the Edentulous Patient

The diagnostic criteria are organized by their objective nature and not in their rank of significance.

Residual Bone Height-Mandible only

Type I (most favorable): residual bone height of 21 mm or greater measured at the least vertical height of the mandible.

Type II: residual bone height of 16 to 20 mm measured at the least vertical height of the mandible.

Type III: residual alveolar bone height of 11 to 15 mm measured at the least vertical height of the mandible.

Type IV: residual vertical bone height of 10 mm or less measured at the least vertical height of the mandible.

Residual Ridge Morphology: Maxilla Only

Type A (most favorable)

- ☐ Anterior labial and posterior buccal vestibular depth that resists vertical and horizontal movement of the denture base.
- ☐ Palatal morphology resists vertical and horizontal movement of the denture base.
- ☐ Sufficient tuberosity definition to resist vertical and horizontal movement of the denture base.
- ☐ Hamular notch is well defined to establish the posterior extension of the denture base.
- ☐ Absence of tori or exostoses.

TYPE B

- ☐ Loss of posterior buccal vestibule.
- ☐ Palatal vault morphology resists vertical and horizontal movement of the denture base.
- ☐ Tuberosity and hamular notch are poorly defined,
- ☐ compromising delineation of the posterior extension of the denture base.
- ☐ Maxillary palatal tori and/or lateral exostoses are rounded and do not affect the posterior extension of the denture base.

Type C

- ☐ Loss of anterior labial vestibule.
- ☐ Palatal vault morphology offers minimal resistance to vertical and horizontal movement of the denture base.
- ☐ Maxillary palatal tori and/or lateral exostoses with bony undercuts that do not affect the posterior extension of the denture base.
- ☐ Hyperplastic, mobile anterior ridge offers minimum support and stability of the denture base.
- ☐ Reduction of the post malar space by the coronoid
- ☐ process during mandibular opening and/or excursive movements.

Type D

- ☐ Loss of anterior labial and posterior buccal vestibules.
- ☐ Palatal vault morphology does not resist vertical or horizontal movement of the denture base.
- ☐ Maxillary palatal tori and/or lateral exostoses rounded or undercut) that interfere with the posterior border of the denture.
- ☐ Hyperplastic, redundant anterior ridge.
- ☐ Prominent anterior nasal spine.

Muscle Attachments: Mandible only

The effects of muscle attachment and location are most important to the function of

a mandibular denture.

These characteristics are difficult to quantify. The classification system follows a logical progression to describe the effects of muscular influence on a mandibular denture. The clinician examines the patient and selects the category that is most descriptive of the mandibular muscle attachments.

Type A (most favorable)

- ☐ Attached mucosal base without undue muscular impingement during normal function in all regions.

Type B

- ☐ Attached mucosal base in all regions except labial vestibule.
- ☐ Mentalis muscle attachment near crest of alveolar ridge.

Type C

- ☐ Attached mucosal base in all regions except anterior buccal and lingual vestibules- canine to canine.
- ☐ Genioglossus and mentalis muscle attachments near crest of alveolar ridge.

Type D

- ☐ Attached mucosal basic only in the posterior lingual region.
- ☐ Mucosal base in all other regions is detached.

Type E

- ☐ No attached mucosa in any region.

Maxillomandibular Relationship

The classification of the maxillomandibular relationship characterizes the position of the artificial teeth in relation to the residual ridge and/or to opposing dentition.

Examine the patient and assign a class as follows:

Class I (most favorable):

Maxillomandibular relation allows tooth position that has normal articulation with the teeth supported by the residual ridge.

Class II

Maxillomandibular relation requires tooth position outside the normal ridge relation to attain esthetics, phonetics, and articulation (eg., anterior or posterior tooth position is not supported by the residual ridge; anterior vertical and/or horizontal overlap exceeds the principles of fully balanced articulation).

Class III

Maxillomandibular relation requires tooth position outside the normal ridge relation to attain esthetics, phonetics, and articulation (ie. crossbite-anterior or posterior tooth position is not supported by the residual ridge).

Classification System for Complete Edentulism

Class I

This classification level characterizes the stage of edentulism that is most apt to be successfully treated with complete dentures using conventional prosthodontic techniques. All four of the diagnostic criteria are favorable.

- ☐ Residual bone height of 21 mm or greater measured at the least vertical height of the mandible on a panoramic radiograph.
- ☐ Residual ridge morphology resists horizontal and vertical movement of the denture base; Type A maxilla.
- ☐ Location of muscle attachments that are conducive to denture base stability and retention; Type A or B mandible.
- ☐ Class I maxillomandibular relationship.

Class II

- ☐ This classification level distinguishes itself by the continued physical degradation of the denture supporting anatomy, and, in addition, is characterized by the early onset of systemic disease interactions, patient management, and/or lifestyle considerations.
- ☐ Residual bone height of 16 to 20 mm measured at the least vertical height of the mandible on a panoramic radiograph.
- ☐ Residual ridge morphology that resists horizontal and vertical movement of the denture base; Type A or B maxilla.
- ☐ Location of muscle attachments with limited influence on denture base stability and retention; Type A or B mandible.
- ☐ Class I maxillomandibular relationship.
- ☐ Minor modifiers, psychosocial considerations, mild systemic disease with oral manifestation

Class III

This classification level is characterized by the need for surgical revision of supporting structures to allow for adequate prosthodontic function. Additional

factors now play a significant role in treatment outcomes.

- ☐ Residual alveolar bone height of 11 to 15 mm measured at the least vertical height of the mandible on a panoramic radiograph.
- ☐ Residual ridge morphology has minimum influence to resist horizontal or vertical movement of the denture base; Type C maxilla.
- ☐ Location of muscle attachments with moderate influence on denture base stability and retention;
- ☐ Type C mandible.
- ☐ Class I, II, or III maxillo-mandibular relationship.
- ☐ Conditions requiring pre-prosthetic surgery
 - minor soft tissue procedures;
 - minor hard tissue procedures including alveoloplasty
 - simple implant placement, no augmentation required;
 - multiple extractions leading to complete edentulism for immediate denture placement.
- ☐ Limited interarch space (18-20 mm)
- ☐ Moderate psychosocial consideration and/or moderate oral manifestations of systemic diseases or conditions such as xerostomia
- ☐ TMD symptoms present
- ☐ Large tongue (occludes interdental space) with or without hyperactivity.
- ☐ Hyperactive gagging

Class IV

This classification level depicts the most debilitated edentulous condition. Surgical reconstruction is almost always indicated but cannot always be accomplished because of the patient's health, preferences, dental history, and financial considerations. When surgical revision is not an option, prosthodontic techniques of a specialized nature must be used to achieve an adequate treatment outcome.

- ☐ Residual vertical bone height of 10 mm or less measured at the least vertical height of the mandible on a panoramic radiograph.
- ☐ Residual ridge offers no resistance to horizontal or vertical movement; Type D maxilla.
- ☐ Muscle attachment location that can be expected to have significant influence on denture base stability and retention; Type D or E mandible.
- ☐ Class I, II, or III maxillomandibular relationships.
- ☐ Major conditions requiring pre-prosthetic surgery:
 - complex implant placement, augmentation required;

- surgical correction of dentofacial deformities;
 - hard tissue augmentation required;
 - major soft tissue revision required, ie., vestibular extensions with or without soft tissue grafting.
- ☐ History of paresthesia or dysesthesia.
 - ☐ Insufficient interarch space with surgical correction required.
 - ☐ Acquired or congenital maxillofacial defects.
 - ☐ Severe oral manifestation of systemic disease or conditions such as sequelae from oncological treatment.
 - ☐ Maxillo-mandibular ataxia (incoordination).
 - ☐ Hyperactivity of tongue that can be associated with a retracted tongue position and/or its associated morphology.
 - ☐ Hyperactive gag reflex managed with medication.
 - ☐ Refractory patient (a patient who presents with chronic complaints following appropriate therapy).
 - ☐ These patients may continue to have difficulty achieving their treatment expectations despite the thoroughness or frequency of the treatments provided.
 - ☐ Psychosocial conditions warranting professional intervention.

Guidelines for Use of the Complete Edentulism Classification System

- In those instances when a patient's diagnostic criteria are mixed between two or more classes, any single criterion of a more complex class places the patient into the more complex class. The analysis of diagnostic factors is facilitated with the use of a worksheet.
- Use of this system is indicated for pretreatment evaluation and classification of patients. Reevaluation of classification status should be considered following preprosthetic surgery. Retrospective analysis on a post-treatment basis may alter a patient's classification.
- The classification system for complete edentulism is based on the most objective criteria available to facilitate uniform utilization of the system. With such standardization, communication will be improved among dental professionals and third parties.

- This classification system will help to identify those patients most likely to require treatment by a specialist or by a practitioner with additional training and experience in

Prosthodontic Diagnostic Index(PDI) Classification System						
Prosthodontic Diagnostic Index Complete Edentulism Checklist						
		Class I	Class II	Class III	Class IV	
Bone Height-Mandibular	21 mm or greater					
	16-20 mm					
	11-15 mm					
	10 mm or less					
Ridge Morphology-Maxilla	Type A-resists vertical & horizontal, hamular notch, no tori					
	Type B-no buc vest, poor hamular notch no tori					
	Type C-no ant vest, min support, mobile ant ridge					
	Type D-no ant/post vest, tori, redundant tissue					
Muscle Attachments-Mandibular	Type A-adequate attached mucosa					
	Type B-no b attach mucosa (22-27), +mentalis m					
	Type C-no ant b&l vest (22-27), +genio & mentalis m					
	Type D-att mucosa in post only					
	Type E-no att mucosa, cheek/lip moves tongue					
Maxillomandibular Relationships	Class I					
	Class II					
	Class III					
Conditions Requiring Preprosthetic Surgery	Minor soft tissue procedures					
	Minor hard tissue procedures					
	Implants - simple					
	Implants with bone graft - complex					
	Correction of dentofacial deformities					
	Hard tissue augmentation					
	Major soft tissue revisions					
Limited Interarch Space	18-20 mm					
	Surgical correction needed					
Tongue Anatomy	Large (occludes interdental space)					
	Hyperactive- with retracted position					
Modifiers	Oral manifestation of systemic disease					
	Mild					
	Moderate					
	Severe					
	Psychosocial					
	Moderate					
	Severe					
	TMD Symptoms					
	Hx of paresthesia or dysesthesia					
	Maxillofacial defects					
	Ataxia					
	Refractory Patient					
ICD-9-CM Diagnostic Codes		525.41	525.42	525.43	525.44	
Guidelines for use of the worksheet						
1. Any single criterion of a more complex class places the patient into the more complex class.						
2. Initial preprosthetic treatment and/or adjunctive therapy can change the initial classification level.						
3. In the situation where the patient presents with an edentulous maxilla opposing a partially edentulous mandible, each arch is diagnosed with the appropriate classification system.						

advanced techniques. This system should also be valuable to research protocols as different treatment procedures are evaluated.

CHAPTER 3

ANATOMY OF THE EDENTULOUS PATIENT

HARD TISSUE ANATOMY OF EDENTULOUS MAXILLARY ARCH

The osseous structures not only support the dentures but have a direct bearing on the impression-making procedures, the arrangement of the artificial teeth, and the contouring of the finished denture bases. The maxillary complete denture is supported by two pairs of bones: the maxillae and the palatine bones.

Maxillae

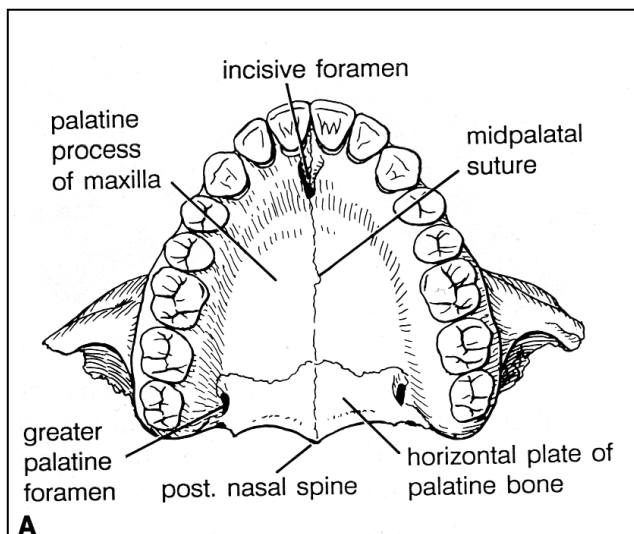
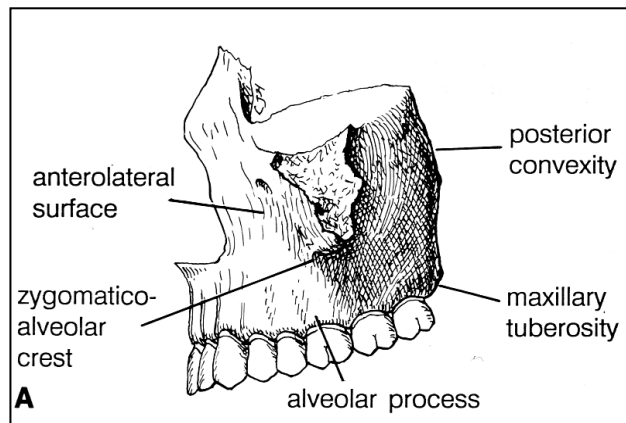
After the natural teeth were removed, the alveolar processes of maxillae will slowly resorb due to the lost of the tensile stimulation from the periodontal ligament. The buccal and lingual cortical plates will eventually fused

to form the edentulous ridges.

The posterior surface of the maxillary body ends inferiorly as a convexity termed the **maxillary tuberosity**. The palatine processes of the maxillae are united in the midline by the mid palatine suture. Even though the hard palate is part of the primary denture bearing areas, but due to the thin mucosal coverage, the

mid palatine suture area usually requires relief in the processing of denture base.

The incisive foramen is located in the midline of the palate, posterior to the original maxillary central incisors. The nasopalatine nerves and blood vessels exit to the palate at right angles to the margins of this bony foramen. It is covered by

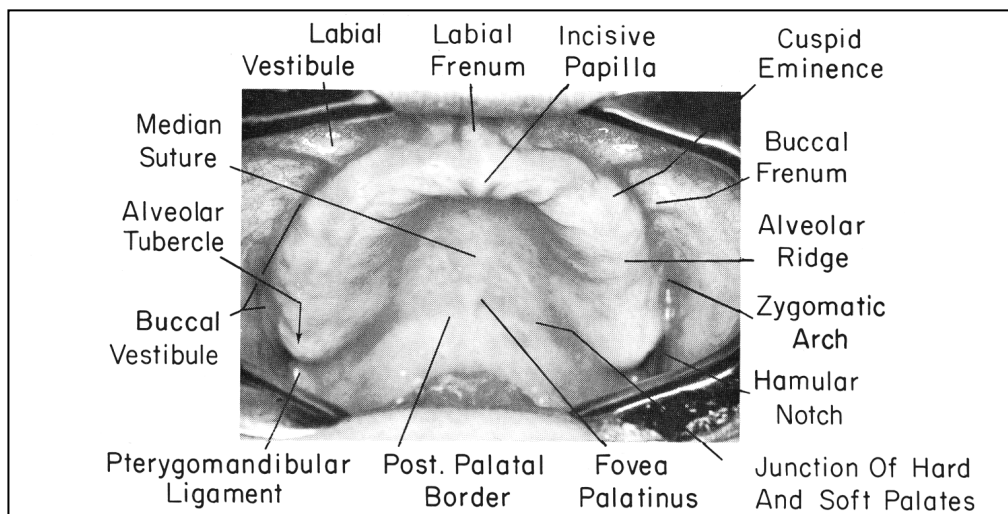


protective pad of fibrous tissue called the incisive papilla. The denture base should also be relieved over this area to prevent irritation to the nerve and pressure to the blood vessels.

Palatine bones

The horizontal plates of the palatine bones articulate with the posterior border of the horizontal palatal processes of maxillae. The posterior margins of the hard palate serve as the anterior attachment of for the soft palate. The posterior palatal seal should follow the contour of the posterior border of the hard palate from hamular notch to hamular notch following a curved line determined by the functional movement of the soft palate.

SOFT TISSUE ANATOMY RELATING TO THE MAXILLARY COMPLETE DENTURE BORDERS



The following is a list of the significance of and movements or manipulations the dentist and/or the patient make to capture the following important denture border landmarks:

Labial frenum	<i>Frenum</i> - folds of mucous membrane and do not contain significant muscle fibers. High frenum attachments will compromise denture retention and may require surgical excision (frenectomy). Usually no muscular fibers in the edentulous state. Labial frenum must be manipulated by the operator to get a more defined recording.
Orbicularis Oris	Do not insert into bone. Sphincter function and require proper

	support of teeth in order to produce normal appearance of philtrum or nasolabial fold. The operator can ask the patient to pucker or produce exaggerated "M" sound.
Buccal Frenum Buccinator	Ask the patient to make "O" or "E" sound or manipulate by pulling corner of mouth out and down.
Coronoid Process	Lateral border of post malar pocket. Open moderately wide and move mandible side to side.
Palatoglossus Posterior border of post malar pouch.	Open wide and place tongue out of the mouth.
Zycomatico-alveolar crest	Relief might be needed due to the thin mucosal covering
Hamular notch	This narrow cleft extends from the tuberosity to the pterygoid muscles. The pterygomandibular ligament attaches to the pterygoid hamulus, which is a thin curved process at the terminal end of the medial pterygoid plate of the sphenoid bone. Capturing the hamular notch in the impression is critical to the retention of the maxillary denture. Improper molding of this area could lead to soreness and loss of retention.
Pterygomandibular Ligament/Raphe	Is pulled forward when mouth is open wide
Fovea Palatini	Remnants of nasopharyngeal ducts (coalescence of mucous glands). Always on soft tissues.
Post Dam Area	Comprised of tensor palatini; predominantly horizontal fibers Levator veil palatini; predominantly oblique fibers. Uvealis; predominantly vertical fibers.
Vibrating Line	It is an imaginary line - notch to notch, usually about 1mm posterior of fovea. Always on soft tissue. Higher vault - more abrupt and forward. Flat vault - more posterior. Denture ends at this line.

HARD TISSUE ANATOMY OF EDENTULOUS MANDIBLES

The body of mandible carries the alveolar processes. The distal portion of each side connected to the mandibular ramus. The ramus divides superiorly into the

Condylar process and the coronoid process.

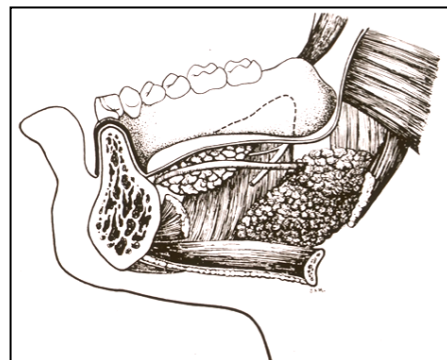
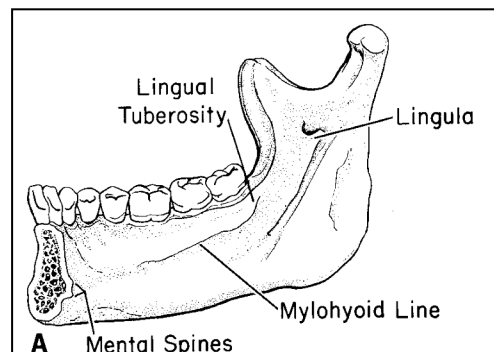
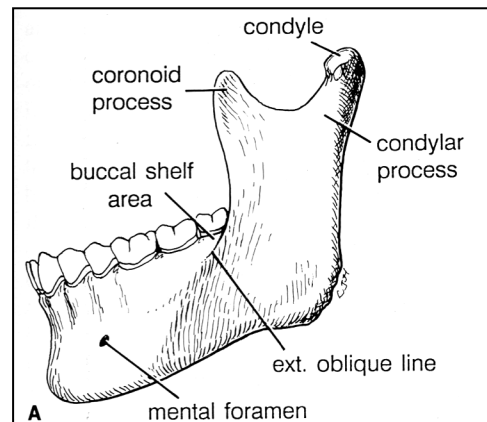
The **coronoid processes** serve as the insertion of the temporalis muscle. While the mandible is moving, the anterior border of the ramus extended toward the maxillary alveolar processes. If the distobuccal flange of the maxillary denture is too thick, it will cause discomfort and may dislodge the denture during lateral excursion.

The **external oblique line** is a ridge of dense bone extended from above the mental foramen. This line is the anatomic guide for the lateral termination of the buccal flanges of the mandibular denture.

The **buccal shelf** area is bounded externally by the external oblique line and internally by the slope of the residual ridge. The bone of the buccal shelf area is very dense and will serve as the primary support of the mandibular denture.

The **mental foramen** is located on the lateral surface of the body of mandible between the first and second premolar about half way between the lower border of the mandible and the alveolar crest. If the resorption of the residual ridge is extensive, the denture base must be relieved over the foramen to keep the denture base from irritating the mental neuromuscular bundle.

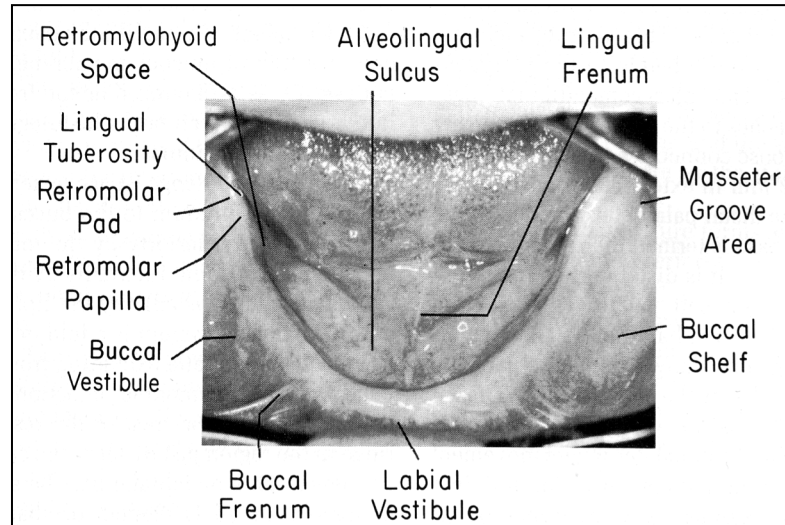
The **mylohyoid line** is a bony crest extended from the 3rd molar region to the lower border in the area of the chin. It is the insertion of the mylohyoid muscle. The lingual flange of the mandibular denture should extend inferior to it but not lateral to this line.



SOFT TISSUE ANATOMY RELATING TO THE MANDIBULAR COMPLETE

DENTURE BORDERS

When teeth are lost the mandible gets shorter and narrower bucco-lingually. The crest gets narrow and sharp. The width of bone widens in molar areas as crest resorbs. In the



anterior, bone is lost from the lingual and bone appears to move forward. Bone is often at the level of floor of mouth when mandible is viewed from side. Overall, mandibular ridge is high in posterior and low in the anterior.

The following is a list of the significance of, and movements or manipulations the dentist and/or the patient make to capture the following important denture border landmarks:

Labial Frenum	Relief might be needed, even though there is no muscle fiber in it.
Orbicularis Oris	Exaggerated "M" sound.
Anterior Masseter	Fibers pass outside buccinator. Muscle pushes in. Clenching or biting closing force while border molding will contract muscle.
Pterygomandibular Ligament	Patient will be asked to open wide. Stretch.
Retromylohyoid Posterior Border Styloglossus, Stylohyoid, Palatoglossus	Place tongue over handle of tray.
Mylohyoid	Fibers become shorter or smaller progressing anteriorly. Place tongue into opposite cheek.
Genioglossus	Place tongue over handles of tray and wet upper lip.
Anterior buccal flanges	Several muscles attached (buccal frenum to buccal frenum). Short flange (mental foramen - often on top of ridge). Labial frenum attached to orbicularis oris sensitive and active.

Buccal Vestibule	Extends from buccal frenum to retromolar pad and from crest of ridge to cheek.
Buccal Frenum	Patient will be asked to make "OU" or "E" sound if necessary. Connects with band from maxillary thru modiolus. Fibers will pull and must be free to move. Lip must be supported.
Buccinator Muscle	Patient will be asked to make "OU" or "E" sound if necessary. It is a muscle runs anterior-posteriorly and extend from modiolus to pterygomandibular raphe. It's inferior portion attached to buccal shelf. While the buccinator contracted, it will help to seat the denture rather than lifting the denture.
Buccal Shelf	Bordered: medially by crest of ridge, anteriorly by buccal frenum, laterally by external oblique ridge and distally by retromolar pad. It is the primary stress bearing area of mandibular denture. Because there is good cortical bone at right angle to occlusal plane.
Buccal flange	It extends from frenum to anterior masseter It is wide and extends into the cheek to cover buccal shelf
External Oblique Ridge	DOES NOT LIMIT extent of buccal flanges. Flange can extend up to or over EOR- wherever the mucobuccal fold ends.
Distobuccal Flange Masseter region	flange converges medially with action of masseter. (masseteric notch).
Distal Extent	Limited by buccinator and lateral bony process. Denture extends to include retromolar pad which provides a soft tissue seal.
Retromolar Pad	Contains some glandular tissue, tendon of temporal muscle, buccinator fibers, fibers of the superior pharyngeal constrictor on the lingual and from the pterygomandibular raphe at the distal.

CHAPTER 4

PRELIMINARY IMPRESSION

Instructions for Laboratory Procedures

LAB Session 1

1. Initial Casts Which Represent The Patient

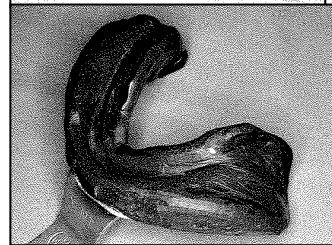
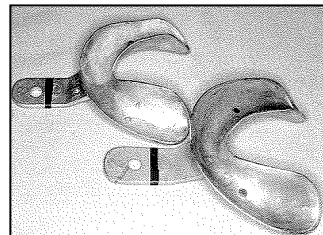
The patient for this course will be represented by maxillary and mandibular edentulous stone casts which you will obtain by pouring "Resin Rock" in supplied VIADE molds. These casts are fabricated by our dental laboratory before the semester. They will be distributed in the beginning of Lab session 1. Once you received the cast, examine your patient's arches. Identify as many anatomical landmarks as possible by correlating what the casts shown .



2. Preliminary (Primary) Impressions of Patient

There are 2 acceptable methods for preliminary impressions of complete denture.

- a. Alginate impression with properly fitted Rim-Lock metal trays
- b. Thermoplastic impression compound cake carried by an edentulous aluminum tray.



(Clinical decision needs to be made based on the residual ridge anatomy, mouth opening, gagging reflex and other factors)

a.) Select the correct size of metal Rim-lock impression trays for impressions of the patient's arches. Make sure the trays provide for 1/4 inch (6 mm) of lateral clearance and that they are long enough to record the most distal landmarks in the respective arches, even if you must lengthen the trays with sticky wax and baseplate wax.

Practice Pearl: To prevent adhesion of alginate to the "patient", the Resin Rock casts should be saturated with water. Immerse the casts in water for at least 5

minutes, leaving some portion of each cast above water level for air to escape as water is drawn in by capillary action.

b) The preliminary impressions should be slightly overextended. Make sure that you record all the vestibular areas. It may therefore be advisable to apply alginate to the border areas of the patient with your finger before seating the loaded tray. Similarly, paint alginate into the patient's palatal vault before seating the loaded maxillary tray to minimize the likelihood of trapping air there.

c.) Use of modeling plastic impression compound for preliminary impressions: Not infrequently an edentulous patient presents with ridges (usually on the mandibular) so resorbed that accurately recording their form and extent with hydrocolloid (alginate is irreversible hydrocolloid) is not possible because the hydrocolloid is so easily displaced by the soft tissues that surround and obscure any semblance of what little bony ridge may be present. We then resort to the use of modeling plastic impression compound.

Modeling plastic is a thermoplastic impression material composed of wax, rosin, resins, and colorants. When softened in hot water it has very high viscosity and placed in an edentulous impression tray it has the ability to displace the soft tissues around the edentulous ridge instead of being displaced by them. Used mainly for preliminary impressions when alginate impressions are not successful, it usually can capture the ridge but may well have borders that are overextended in all directions. Modeling plastic is supplied in sticks and cakes of different colors which have different melting - softening temperature ranges. Red compound softens at the highest temperature comfortable for a patient's mouth. There are also green, gray and white compounds with successively lower softening temperatures. We usually use red cake compound for preliminary impressions and green stick compound for border molding final impression trays.

Procedure:

Soften one cake of red modeling plastic impression compound (1 %cakes for a maxillary impression) by submerging it in a water bath at 140 degrees Fahrenheit)

for 3 to 5 minutes. Be sure to place it on the removable carrying platform with a paper towel wrapped around it and held by a rubber band, to prevent melted compound from adhering to the metal reservoir of the water bath.

When the plastic is thoroughly softened pick it up with wet gloved hands and mold it ("squish" it) into a homogeneous sausage of 4 inches. Secure this sausage to the impression surface of an appropriately-sized edentulous tray. As the compound cools it hardens, so carefully submerge the tray and compound in the water bath to re-soften it. The compound is suitable for impression-making when it is the consistency of putty or modeling clay.

Inform the patient that you are going to place "some warm wax" in the mouth for an impression - and do so. Bring the impression tray directly over the ridge area and for a mandibular impression, face the patient and place your right and left index fingers on the tray in the first molar areas and your thumbs under the patient's mandible, pressing hard enough in an apical direction to seat the impression on the patient's mandible. (If you make your impressions while seated behind and to one side of the patient as most experienced dentists do, reverse the finger position, placing thumbs on the tray and index fingers under the mandible.) After 5 or 10 seconds the impression will be hard enough to remove from the mouth. Then chill it under cold water and examine it for evidence of a good impression of the edentulous ridge. It will invariably be overextended. Re-seat the impression in the mouth. A mandibular preliminary compound impression should display some positive retentiveness in the mouth. An acceptable maxillary preliminary compound impression will generally have moderate to good positive retention in the patient's mouth.

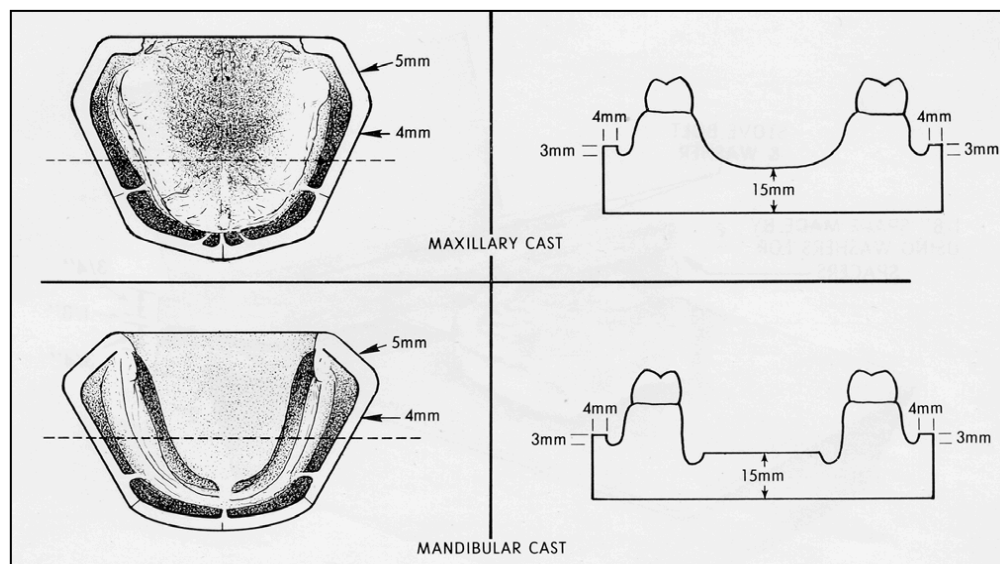
If you perceive any border areas which are recognizably deficient or underextended, these may be corrected by the addition of green stick compound in those areas:

Melt the end of a stick of green modeling plastic over a flame and "paint" the melted green compound on the appropriate border area of the cold red impression. Flame the interface of green and red compound to homogenize the area. Then, first dipping that area of the impression in the water bath to temper it, replace it in the mouth to record the border in the deficient area. Several areas may be corrected in this way. Pour plaster in this impression to form the preliminary cast.

It may be more difficult to separate a cast from a compound impression than from hydrocolloid, as both the impression and cast are equally hard. Forcing the separation will probably fracture the cast if there are ridge undercuts, so immerse the impression portion in hot water (140 degrees Fahrenheit) to soften the compound. This will permit easy separation.

3. Pour Preliminary Casts in Laboratory Plaster

Do not invert the impression (cast side down) until after the initial set of the stone/plaster. You should be able to make the maxillary cast thick enough to avoid having to form a base separately without having to insert it into a mound of plaster. Use a two-stage pour technique for the mandibular cast before it sets. To do this, place 3 to 5 irregular bumps of the initial mix of plaster on the base surface of the cast with the impression side down, before the initial set of the plaster. After initial set and with the 'bumps' in place, wet the cast and now invert the impression/cast on a mass of new plaster/stone. Avoid heaping the new plaster up in the tongue space to maintain ready accessibility of the mandibular border areas. Trim the bases of both casts after you recover them from the impression. Both casts should be trimmed to provide a base 12 to 15 mm thick and a land area of 3-4mm width lateral to the facial border of the bucca-labial vestibule and distal to the posterior border of the retromolar pads.



CHAPTER 5

FABRICATION OF CUSTOM TRAYS

Instructions for Laboratory Procedures

LAB Session 2

1. Mounting Patient Casts on the Articulators

a) Prepare your articulator by attaching mounting plates. Make sure that all articulator settings are locked in position. The incisal pin is set with the rounded end down if the plastic flat incisal guide table is used, the chisel end down with the metal adjustable table. The centric locking latch is firmly locked in position; the condyle angles at 30 degrees. Apply a very light coat of Vaseline or silicone spray to all surfaces of the articulator to facilitate cleaning and preserving your instrument.

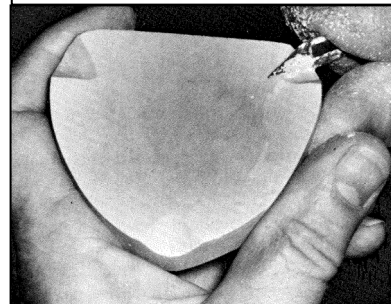


b) Prepare index grooves on the bases of both patient casts with a large acrylic resin bur or an arbor band. Make three longitudinal grooves in the flat surfaces of the base of the cast, one in each posterior corner and one at the anterior midline of the cast (illustration). The three grooves will point forward toward the center of the base of the cast. Avoid making undercuts.



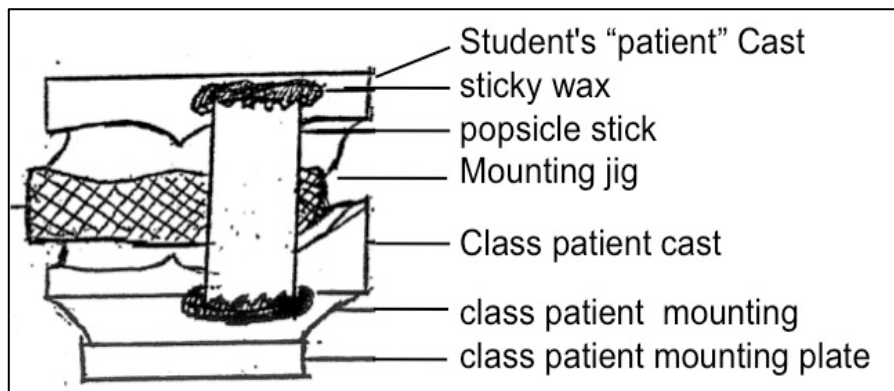
c) Purpose of the index grooves:

1. To enhance the cohesion of the cast and the mounting stone;
2. To enable re-positioning of the cast precisely on the mounting if the cast and mounting are separated unintentionally or inadvertently.



Your goal is to mount your “patient” casts on your articulator in exactly the same position and jaw relationship as those on the Simulated Patient (class articulator). A custom mounting jig provided with each Simulated Patient will help enable you to do so.

d) Select a class patient's mounted maxillary or mandibular cast. Place the plastic mounting jig on the class patient's cast. Place your opposing patient cast in the mounting jig. Secure the two casts and mounting jig to each other by using sticky wax and tongue blades or wooden popsicle sticks. Screw the complex of casts and mounting jig to the appropriate bow of your articulator, first removing the blank



mounting plate from that bow.

Very lightly lubricate just the index grooves of your patient cast with Vaseline and moisten the surface of the case base with a wet paper towel. Attach your cast to your articulator with a mix of 2 envelopes of mounting stone. Being neat now will facilitate your progress later.

e) After the mounting stone is well set (about 8-10 minutes) remove the wooden sticks and remove both mounted casts from the articulator. Unlocking and opening the centric relation lock will ease opening the articulator and removing the jig. Re-lock the centric locking latch. Return the class patient's cast.

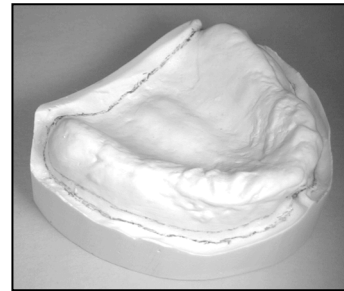
Place the mounting jig on your newly mounted patient cast and your patient's opposing cast in the jig. Again secure the casts together with wooden Krasne sticks and sticky wax. Replace the complex of casts and mounting jig on the instrument and check to make sure that the incisal pin is still set at zero, the centric stops are locked, and the mounting plates are tightly secured to the articulator.

Now mount the second patient cast with a mix of 2 envelopes of mounting stone. Remove the mounting sticks, open the centric stops and the articulator and return the mounting jig to the class articulator. Remove your mounted casts from your articulator and thoroughly clean the casts and instrument.

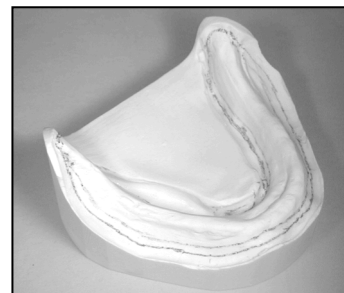
2. Making Final Impression Trays

a) Maxillary tray:

With a lead pencil, scribe a continuous line in the greatest depth of the vestibule from the posterior limit of one buccal space to the other, carefully going completely around the frena and muscle attachments. Across the posterior position of the palate, draw a line straight across from the right hamular notch to the left. Draw another line 4 mm posterior to the hamular-hamular line then with a plaster knife level the entire land area of the cast. The posterior level should end at the outer hamular-hamular line. The facial level should end just facial (1-2 mm) to the line at the depth of the bucca-labial sulcus. Finally, draw a line 2 mm occlusal to the depth-of-sulcus line with a **RED PENCIL**. This new line, together with the hamular-hamular line locates the border of the final maxillary impression tray.



b) Mandibular With a lead pencil, draw a depth-of-sulcus line completely around the facial vestibule, carefully going around the frena and muscle attachments. Be sure to include the buccal shelf areas within the periphery of this outline. At the posterior borders of the retromolar pads, the line should touch these structures. Outline the depth of the alveo lolingual sulcus. With a **RED PENCIL**, draw a second line 2 mm occlusal to the depth-of-sulcus line facially and lingually and forming the line around the distal border of the retromolar pads. This second line locates the borders of the mandibular final impression tray.



c) **Block out** the undercuts of the preliminary plaster cast of the maxillary alveolar ridge. Looking directly down on the maxillary cast, note the labial undercut from

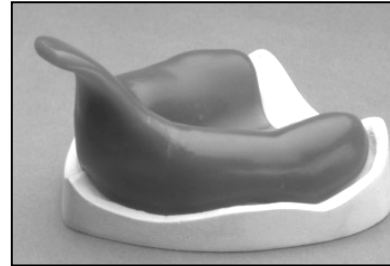
canine to canine. Using the heated wide end of a Number 7 or 31 wax spatula, add melted baseplate wax to fill (not overfill) this undercut. Repeat this process on the preliminary plaster cast of the patient's mandible. Note that there is a very shallow labial undercut of the canine- to-canine area and fairly significant bilateral lingual undercuts in the mylohyoid and retromylohyoid areas right and left. Completely block out these lingual undercuts all the way to the lingual frenum with melted baseplate wax, using a Number 31 spatula. Do not block out the lingual sulcus of the mandibular preliminary cast.

d) **Relief:** Determine those areas of the preliminary plaster casts which are likely to be overcompressed by the impression and subsequent dentures. Such areas normally include in the maxillary arch the incisive papilla, prominent rugae and median palatine raphe, and in both arches any tori, sharply shaped exostoses and excessively mobile soft tissues on ridge crests. Outline all such areas with a pencil and flow or place-within these outlines a thickness of medium baseplate wax not to exceed 1.0 mm. You will thus create that much relief space on the tissue surface of the impression tray to avoid excessive pressure on bony areas and distortion of readily displaceable soft tissues when making the final impression.

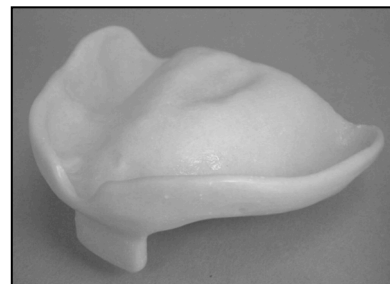
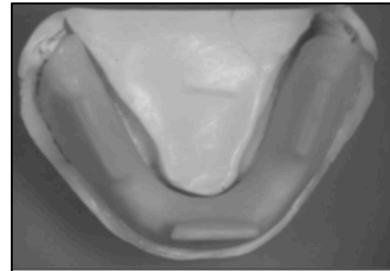
e) **The Final impression Tray:**

- (1) The outline form of the tray will be marked by the **second line** you draw **with RED PENCIL** on the preliminary casts (2 mm occlusally from the line at the depth of the bucca-labial and lingual-alveolar sulci). Score this outline with a sharp instrument (the sharp end of a Number 7 wax spatula, Roach a Vehe or a discoid-cleoid carver). This scored line will register on the impression surface of the tray as a ridge and will clearly mark the tray border. Note that the posterior border of the maxillary tray is a line from hamular notch to hamular notch straight across the palate. This means that the posterior portion of the maxillary tray will be slightly over- extended toward the posterior.
- (2) Triad Trays: To avoid adhesion of the Triad Tray material to the casts, coat the casts with Triad model release agent(MRA).

f) Gently apply a sheet of blue Triad Tru-tray material to the maxillary cast.(Don't forget to remove the plastic protective sheets!) You may use a Triad modeling instrument or the broad end of a wax spatula. Adapt the material first into the palatal vault with the posterior edge of the Triad along the marked posterior border of the tray. Avoid excessive pressure on the ridge crests, as this will result in thinning, but strive for good adaptation all over the denture base area and maintain the original thickness of the material. Trim away the excess Triad material with a scalpel-bladed knife, maintaining a right angle between the tray border and its sides. Save the excess, cut-off Triad material.



g) **Handles:** Use the excessive Triad material to form a patty of 1 inch cube. Firmly adapt these excess Triad material to the trays for handles. Handles should not impinge on the lips or tongue. They should be placed on the crests of the ridges in the approximate position of the incisor teeth, about 10-12 mm in width, and conforming to the curvature of the labial arch. They should be no longer incisogingivally than 15mm (5/8 of an inch) and no thicker than 5mm at the incisal border but should have sufficient bulk to provide a firm grip between your thumb and index finger. Blend the resin of the handle to make it smooth. (NOTICE THE



DIFFERENCE: between the handle of custom trays of fixed prosthodontics and removable complete prosthodontics!)

h) Now place the cast with adapted Triad in the Triad curing unit for two minutes and process. Follow the same general procedure for the mandibular tray.

i) Gently remove the TRIAD impression trays from their casts. Paint TRIAD AIR BARRIER on all surfaces of the trays, place them in the TRIAD oven with tissue sides up and process for 2 minutes. Wash the Air Barrier from the processed trays.

j) Use an acrylic bur and/or arbor band on a lathe, trim tray to the following specifications:

- i. Trim excess to the predetermined tray outline on the cast. Frenum notches should be wide "V"s to allow bordermolding movement.
- ii. Adjust border thickness to 2mm. The borders should be at right angles to the sides without sharp edges or rough irregularities on the tissue surface
- iii. Inspect the entire tray to assure a uniform thickness of 2mm.
- iv. Trim handle to approximately the length, width, thickness and inclination of 2 central incisors.
- v. Smooth external surface to a pumice finish.

NOTE: In pre-doc clinic, outlined casts and finished custom trays need to be inspected and approved by faculty members prior to the 2nd patient visit.

CHAPTER 6

BORDER MOLDING

Instructions for Laboratory Procedures

LAB Session 3

A. DEFINITION

An impression is a record of the negative form of the tissues of the oral cavity that make up the basal seat of the denture. It is used to fabricate the master cast- a positive replica.

B. CHARACTERISTICS OF A GOOD IMPRESSION

1. Include everything within limits of health and function
2. Borders should be in harmony with limiting structures
3. Physiologic type border molding
4. Proper space allowed for impression material
5. Selective pressure while making impression
6. Dimensionally stable materials
7. Shape of impression is similar to form of denture

C. OBJECTIVES OF IMPRESSION

- 1. Retention** - Resistance to removal in direction opposite that of insertion.

Resists gravity, sticky foods, opening and closing jaws. It is the means by which dentures are held in mouth. If tissues are displaced under pressure the denture may lose retention because of change in adaptation of basal surface.

- 2. Stability** - Quality of denture to be firm, steady and constant in position when forces are applied to it. It especially provides resistance against horizontal rotating movement. It depends on the size and form of basal seat, quality of final impression, form of polished surfaces and location and arrangement of artificial teeth.

3. **Support** - Resistance to vertical components of mastication and occlusal direction towards the basal seat
4. **Esthetics**- Proper lip support is obtained when the facial flange extension is molded adequately with proper length and width of custom tray.
5. **Maintain Health**- intimate mucosal adaptation and proper relief

D. FACTORS OF RETENTION

1. **Adhesion** - Attraction of unlike molecules. Acts when saliva wets and sticks to the basal surfaces of dentures and mucous membrane. Depends on close adaptation and fluidity of saliva (thin saliva - good; thick saliva – seems good BUT may push denture away from basal seat because of HYDRAULIC PRESSURE). Adhesion also includes attraction of unlike bodies as in xerostomia "dry mouth" but is not good because denture sticks to cheeks and lips. Cepacol and glycerin mouthwash helps.
2. **Cohesion** - Attraction of like molecules occurs in layer of saliva between denture and tissues.
3. **Interfacial Surface Tension** - Resistance to separation possessed by the film of liquid between denture and tissue. (Similar to cohesion and capillarity.)
4. **Capillary Attraction** - Causes a liquid to rise in a capillary tube because surface tension tends to form a round surface on the liquid. In a well adapted denture, the thin film of saliva will "rise" into contact with denture.
5. **Atmospheric Pressure** - 14.7 lb/in - Operates as a retentive force when dislodging forces are applied, often called "SUCTION". Denture must have a SEAL all the way around. Atmospheric pressure provides AN EMERGENCY RETENTIVE DEVICE. When all fails - atmospheric pressure may hold it in.
6. **Oral and Facial Muscles** - Provides supplementary retentive forces. Teeth are positioned in "neutral zone" between cheeks and tongue. Musculature must automatically fit against the polished surface of the denture and reinforce border seal of each denture. Buccinator muscle should fit snug and seat buccal flanges . Tongue will seat back of maxillary denture.

E. HEALTH OF BASAL TISSUES

1. Tissues must be healthy.

Causes of unhealthy tissues should be found and corrected before impressions are made. Examples are listed below.

Inflammation - swollen tissues will cause ill fitting dentures	1. surgery	2. medication	3. keep old dentures out (at least 24 hours)	4. tissue conditioning
Distortion - from wearing old dentures	1. leave out 1-2 days		2. Use tissue conditioning materials	
Hyperplastic Tissue	1. finger massage	2. If too little space exists between ridges (usually in the tuberosity area) remove surgically (after evaluating mounted diagnostic casts).		

F. THE IMPRESSION MATERIAL

1. **Consistency** - can control the position and shape of the oral tissues. Soft or fluid impression materials displace tissues less. Stiffer impression materials will displace tissue.

2. Tray of Correct Size

- a. should not displace tissues
- b. design of tray should be related to type of impression material selected.

3. Impression material

Polysulfide materials will be used as the final impression material. Due to the low viscosity of the material the tray must fit accurately so that rubber can be closely confined to tissues to be accurate. Very good for thin mandibular ridges with soft tissue undercuts. Can also be removed from cast without breaking cast.

G. TECHNIQUE

First, you have to BORDER MOLD the final impression tray. Border mold by moving tissues against soft material that is SUPPORTED and controlled by tray. Borders of tray must be 2 mm short of reflection of tissue. The tray should always be checked in the mouth before border molding is started as the preliminary cast

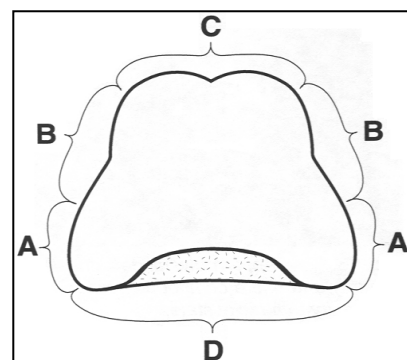
may have been more than 2 mm over extended. Make sure the tray borders are dried with 2 X 2 gauze. Green stick compound is softened, added in sections, heated in a flame, tempered in a water bath 135 degree F. for about 5 seconds, and placed in mouth. Then the patient is instructed (also could be assisted by the dentist) to perform certain movements of lips, tongue, cheeks in order to activate the muscle groups and to form a functional boundary for the thermoplastic compound. If properly softened and tempered, the green compound will allow about 10-15 seconds manipulation time for border molding. Then, you should carefully remove the tray from the mouth, dip the tray into a bowl of cold water, and inspect the border molded flanges. A well border molded area should have full peripheral rolls with a dull appearance surface finish. Excess compound should be trimmed away with sharp Bard Parker knife after the compound completely cooled. The compound should be flush with internal surface of the tray to prevent pre. The Hanau torch could be used to reheat the compound.

Border molding will be affected by:

- a. viscosity of thermoplastic material (soft or stiff)
- b. space available for material
- c. type and amount of manipulation
- d. quality of tissue - loose or tight

MAXILLARY IMPRESSION -BORDER MOLDING:

1. Insert the tray and check for over-extensions or interferences. The edges of the tray should be about 2 mm. from the vestibules, with the movable tissues under moderate tension.



2. Mark the posterior border as before with the indelible stick. Insert the tray and make certain the posterior border is long enough to cover this line. If the tray is too long, the mark will transfer and you can trim the length accordingly. The tray should pass through the hamular notches and 1 mm past the vibrating line. For a Class III palate form, trim the tray exactly to this line.

Maxillary border molding should be done in 6 sections in the order as follows:

A. buccal space (posterior buccal flanges) - cheek out, down, in, move jaw side to side for coronoid process.

B. buccal frenum(anterior buccal flanges) - cheek out, down, in, back and forward
C. labial frenum and labial flange area- upper lip out, down and in. (The movement should be done by the patient alone without the assistance from the operator.)
D. hamular notches and post palatal area -. The vibrating line in the mouth marks the division between the movable and immovable tissues of the palate. It is located by observing the movement of the palatal soft tissues when the patient says "hah" ; its lateral borders are the hamular notches. Compound is placed on the tray over the vibrating line area and thru hamular notches and place in mouth and ask the patient to relax, swallow, relax, open wide (for the hamular notches)
Border molding of post palatal seal will

- a. slightly displace soft tissue to enhance seal
- b. guide for positioning tray for impression
- c. prevent excess from running down throat.

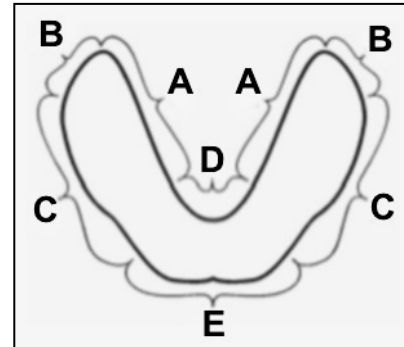
After completing adjustment of the compound, the tissue contacts of the border molding should be slightly relieved with the Bard Parker knife, particularly in the frenum area.

MANDIBULAR BORDER MOLDING

The mandibular border molding involves more movable soft tissue and muscle groups. The insertion of the tray with soften thermoplastic compound also requires following the specific sequence in order to obtain the optimal control of the material. Once the tray being tried and adjusted, suggested sequence of border molding should be followed

- A. Posterior lingual flange- add to molar regions between pre and post mylohyoid areas, protrude tongue to touch the handle of tray, allow action of mylohyoid muscle, the retromylohyoid curtain and superior constrictor muscle will shape the area. Also, ask the patient to close to contract medial pterygoid. When finished - patient should be able to touch upper lip without much displacement of tray
- B. Distal sections (include masseteric grooves and the posterior border of retromolar pads)-Temper the softened compound, carefully rotate the tray into the mouth, and ask the patient to close while holding the tray in position, resisting the closure with your forefingers on the finger rests.

C. Buccal flange area- Insert the tray with compound being careful to retract the cheek with a mouth mirror or your index finger. Be careful to seat the tray evenly. Define the tray extension by molding the lateral border by massaging the cheek or pulling the cheek out > up > in and having the patient pucker and smile. Buccinator is the main muscle group that contributes to the muscle trimming motion in border molding of this section. The motion should follow the similar direction of the contraction of muscle.



- D. Anterior lingual flange area- look for clearance of lingual frenum, sublingual folds, submandibular ducts. Add compound to anterior lingual flange. Have patient stick out tongue and then push tongue against the palate to get functional border.
- E. Anterior labial – gentle moving the lower lip out, up, in to simulate the motion of the perioral muscle groups

PRACTICAL PEARL:

As the border molding is continued in a segmental manner, care must be taken that the compound should be trimmed constantly, to make it flushed to the internal surface of custom tray to ensure complete seating of the tray.

CHAPTER 7

FINAL IMPRESSION

Instructions for Laboratory Procedures

LAB Session 3(cont'd)

Final Impressions and Casts

A. Evaluation of the Impression Trays

Evaluation of the impression trays is made first on the preliminary casts. They should conform to the outlines you scribed on the casts, being 2mm short of the apparent vestibular depth and trimmed so the borders are at right angles to the sides without sharp edges or rough irregularities on the tissue surface. Frenum notches should be wide "V"s. The impression trays are then evaluated in the patient cast. Check first for overextensions on the patient cast for tray conformity and reduce that area with an acrylic resin trimming bur in a laboratory handpiece. Frenum notches should clear the frena by at least 3 mm. On your patient's cast the vibrating line is presumed to be a straight line from one hamular notch to the other through the foveae palatinae. Reduce the over extension of the maxillary impression tray to this line, which will mark the posterior border of the maxillary denture.

B. Border Molding: During this course remember that your "patient" is your mounted Resin Rock casts.

The Mandibular Tray: Gently heat 1 inch of the end of a stick of green impression compound over a Bunsen or micro-torch flame until the compound begins to sag. Apply the softened material to the dried left buccal side of the tray from the left distal border to the left canine area. Dip this portion of the tray in a water bath of 135 degrees Fahrenheit to both temper it and moisten it. Carry it to place in the patient's mouth and hand-massage the patient's cheek to mobilize the sulcus border mucosa and the muscle-frenum attachments of that area, thus establishing

bordercontours of the tray to conform with the patient's functional muscle movements.

Repeat the process at least twice, recording the canine-to-canine vestibula-labial border and the right posterior bucca-labial border in the anterior area. Ask the patient to contract the lips in a pouting movement to record the border contours in motion. Remember to chill the newly-added compound thoroughly in cold water, then dry the tray before adding new compound.

Continue the border-molding exercise for an actual patient but not for this course in at least three segments for the lingual vestibular borders. The patient must mobilize the lingual border tissues by protruding the tongue from the mouth and making side-to-side movements.

On your patient casts that substitute for an actual patient, the border molding procedure is a passive one, as no border movements are possible. In this course, DO NOT LET THE BORDER MOLDING MATERIAL LOCK THE MANDIBULAR LINGUAL UNDERCUTS!

When the border molding exercise is completed, chill the tray and compound border and with a sharp scalpel blade, carefully cut away on the tissue surface of the tray any extrusion of the green compound that extends occlusally past the border toward the ridge crest. At this time, if the border molding is successful, the tray should extend properly to the function extension of the vestibule, when the patient is asked to slightly protrude the tongue or some other border molding movements, the tray should not be lifted.

Now paint a THIN coating of rubber base adhesive on the tissue surface of the tray and on the entire compound border. Put the tray aside to dry thoroughly while molding the border of the maxillary tray.

Practice Pearl: Tray adhesive, to be effective, must be thoroughly dry and non-sticky to the touch when you make the final impression. If not dry, the adhesive won't adhere to the tray or to the impression.

(2) The Maxillary Tray: Initiate the border molding process at the left distobuccal border and continue in segments: heat the green stick compound, add it to a segment of the tray from the distobuccal border anterior to the left buccinator frenum. Temper the added green stick compound in the water bath before placing

the tray in the mouth. Massage the patient's cheek to record functional border limits. Please follow the recommendations from the previous chapter to complete the exercise.

Now, with a laboratory handpiece and a Number 6 round bur or a small acrylic resin trimming bur, drill a hole in the center of the palate of the of the impression tray. The purpose of the hole is

- 1) To permit proper seating of the loaded tray while making the final impression.
- 2) To relieve the pressure over the incisive papilla and the rugae.
- 3) To prevent entrapment of air bubbles in the impression.

Paint a thin coating of rubber base adhesive on the tissue side of the tray and cover the compound borders. Be sure to keep the palatal escape hole open. This will allow air and excess impression material to escape from the palatal vault when the loaded final impression tray is seated. Put the tray aside to dry while making the mandibular impression.

C. Final Impression (Polysulfide rubber)

Practice Pearl: Before making final impressions on your Resin Rock patient casts coat all the impression surfaces of the casts liberally with Al- Cote tin foil substitute and allow them to dry. This will facilitate easy removal of the final impressions from the casts and will provide impressions with smooth tissue surfaces.

(1) Mandibular impression:

Make the mandibular impression first as it is usually the least uncomfortable for the patient. First practice inserting the tray so the patient can easily protrude the tongue with the tray in the mouth. Extrude 5 inches each of base and catalyst pastes of regular (medium) body polysulfide rubber side by side on a mixing pad. Use the side of a stiff mixing spatula in a vigorous circular motion to combine the white and brown pastes and then the flat side of the spatula in a side to side movement to produce a mix with a non-streaked uniform color. The mixing should take no more than 30 seconds. With just the tip of the mixing spatula spread a fairly thin and uniform layer of the material to coat the tissue side of the dry impression tray.

Practice Pearl: A cement spatula while not useful for mixing the rubber base impression is an ideal size to use for loading the tray.

Carry the impression material over the borders of tray and just on to the facial and lingual side, 3-4 mm past the borders. Face the patient and ease the tray into position in the mouth. Have the patient protrude the tongue then hold the tray in position with just the index and middle fingers of your hands on the right and left first molar area. Your thumbs should be under the inferior borders of the mandible and you should exert very gentle but steady pressure toward the ridge. Your fingers should be positioned to avoid as much as possible distorting the patient's tongue, lip and cheek position. As described for the preliminary impression procedure, the position preferred by many experienced dentists is behind and to one side of the patient and the finger position is reversed: Thumbs on the occlusal surface of the tray in the first molar areas and index and middle fingers under the mandible.

Practice Pearl: The border molding should start after the tray has been seated for 30 seconds. Start from the posterior and then the anterior, one side at a time, repeat the border molding for 4 minutes. During the border molding, the tray should be stabilized continuously with equalized holding pressure. In the last 4 -5 minute of setting process, the polysulfide material transition from plastic to elastic phase. DO NOT border mold at this time, just hold the tray in place.

The impression is fully set when a portion of it that is accessible will no longer retain a dent you place in it with your gloved fingernail. Setting time will vary according to proportions of base and catalyst, mixing vigor, time, room temperature and age of the material, but is around 8-10 minutes from the time mixing starts. Carefully cutback the fins or unsupported impression materials with sharp scissors. Examine the impression for voids and deficiencies. If the impression is unacceptable, all the impression material is stripped out and the impression repeated.

Practice Pearl: (1) A single drop of methyl methacrylate monomer placed between the rubber impression and the tray will greatly accelerate and ease removal of the

impression from the tray. (2) Dry the tray, reapply a thin coat of rubber base adhesive, and dry again with air before remaking the impression.

Disinfect: Spray all surfaces of the impression tray with disinfectant, cover with a wet paper towel and set aside.

(2)Maxillary Impression:

(a)Posterior border and post palatal seal

Please see Chapter 8 posterior palatal seal.

In this course, you will mark WITH RED PENCIL ONLY, the posterior border and post-palatal seal area arbitrarily on your Resin Rock patient cast. DO NOT CUT INTO THE CAST!

(b) The Final Maxillary Impression: Express 5-inch lengths of base and catalyst pastes of regular body (medium) polysulfide rubber side by side on a mixing pad. Before starting to mix, place a stack of several 2 by 2 inch gauze pads in the palate and ask the patient to close his/her mouth to keep the pads in position. This will absorb excess salivary moisture, keep the blue markings of the post- palatal seal and posterior border dry, and help improve the surface accuracy of the impression. Mix the impression material as described for the mandibular impression. Load the tray with a relatively shallow and UNIFORM amount of material, carrying it over the facial,borders and 3 to 4 mm past them. Keep the impression material shallow over the post-palatal seal area of the impression tray and flush with the posterior border. It should take no more than 30 seconds to mix the impression and 15 seconds to load the tray.

Just before placing the loaded tray in th mouth, remove the gauze from the patient's mouth. Seat the tray into position gently in a straight path. Ask the patient to relax the lips and cheeks in the mean time to avoid trapping the upper lip inside the impression tray. Exert enough upward force on the tray to guide it into position without causing the tray to "bottom out". Look into the mouth and remove excess impression material is being extruded through the palatal escape hole or the posterior border, then place your index or middle finger over the hole to close it. Ask the patient to tip the head forward to prevent gagging reflex.

Practice Pearl: The border molding should start after the tray has been seated for 30 seconds. Start from the posterior and then the anterior, one side at a time, repeat the border molding for 4 minutes. During the border molding, the tray should be stabilized continuously with equalized holding pressure. In the last 4 -5 minute of setting process, the polysulfide material transition from plastic to elastic phase. DO NOT border mold at this time, just hold the tray in place.

Maxillary impressions are often so retentive that they are difficult to remove from the mouth. You may facilitate removal by one or more of several means. (1) Elevate the mucobuccal fold tissues to disrupt the border seal; (2) Introduce air, water, or air-water spray with the air-water syringe at the border seal area; (3) ask the patient to close the lips and blow out his cheeks, breaking the border seal and introducing air between the impression and the palatal tissues. As soon as you remove the impression from the mouth, allow the patient to rinse.

(c) Evaluation of the Impression: Examine the impression for small air voids. Small air voids (up to 1.5 mm or 1/16 inch) may be acceptable. They will reproduce on the cast as nodules which may easily be removed with an instrument. A single larger air void (up to 4 mm or 3/16 inch) may possibly be corrected if it occurs in the palate away from a border. You can coat the inner surface of the defect with a very thin layer of sticky wax applied with the very hot small end of a Number 7 spatula then slightly over-fill the defect with melted Aluwax. Re-seat the impression in the mouth, press upward and then remove it. Observe the edges of the now corrected defect. Cool the Aluwax with air and if there is any flash of Aluwax beyond the border of the defect, carefully cut it away with a sharp scalpel blade.

Multiple air voids or one larger than 4 mm constitute adequate reasons for stripping the impression from the tray and repeating it. Show-throughs of the tray indicate that the tray has bottomed out and has probably over-compressed the soft tissue it contacts. If small, a single small area of tray show-through may be acceptable, but you should remember that the subsequent denture will also over-compress the soft tissue here with a resultant sore spot. If this defect is larger than 1 or 2 mm or if there are multiple defects of any combination, repeat the impression.

CHAPTER 8

FABRICATION OF WORKING CASTS

Instructions for Laboratory Procedures

LAB Session 3 (cont'd)

PLASTER/ PUMICE MIXTURE

1. a 50/50 mix of plaster and pumice is spatulated to a heavy consistency.
2. The Complaster mixture is placed in a thick mound onto a slab, into which mandibular impression is placed (tray down). The impression is pushed down into the plaster/pumice mix until the mix is about 2mm short of the borders.
3. The land area should then be smoothed and evened off until a shelf is formed 3mm short of the borders and about 10 mm wide. Be certain that tongue area is smooth and even. The mass may be trimmed on the model trimmer so that it is 10 mm wide at the land area and that the "base" is smooth and parallel to the occlusal plane.

BOXING

Coat the vertical sides with a very thin layer of sticky wax applied with the very hot broad end of the #31 spatula. Gently warm a strip of red boxing wax over a Bunsen burner flame to make it flexible, then wrap it completely around the complaster to form a chimney that extends 15mm above the highest part of the upward-facing impression. The palatal vault of the maxillary impression and the lingual borders of the mandibular are usually the highest parts of those respective impressions.

Make sure the boxing wax adheres to the complaster, then seal the bottom border of the boxing wax by applying the hot broad end of the #31 spatula. Look inside the impression and seal the upper facial junction of the boxing wax to the complaster by flowing in small amounts of baseplate wax with the heated pointed end of the #31 spatula. Finally paint model releasing agent(MRA) or Vaseline on the flat, upward-facing surface of the complaster as a separating medium for the stone cast you will pour next.

POURING THE IMPRESSIONS

1. The impressions are poured in **Microstone** that has been vacuumed mixed at a water/powder ratio recommended by the manufacturer .

SEPARATING THE IMPRESSION AND THE CAST

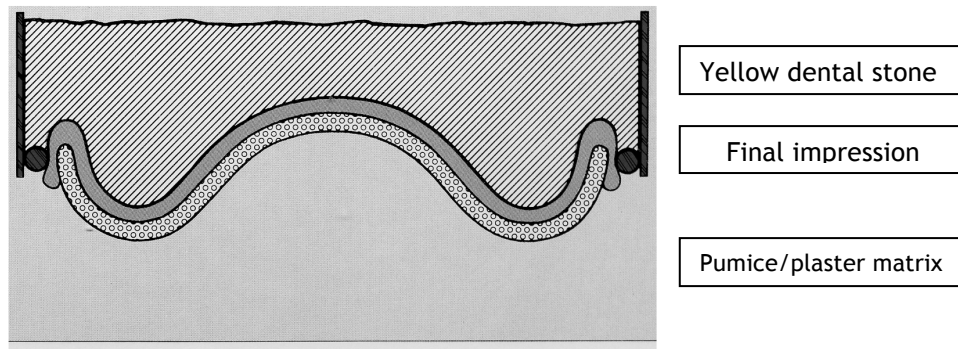
1. After stone is set (about 45 minutes) remove all wax.
 2. Place casts in hot water to soften border molding compound. This will facilitate separation of impressions from casts.
 3. Gently pry with knife at border of stone and plaster/pumice and separate the two.
- If more force is needed, rap the plaster./pumice portion with a spatula handle to initially loosen cast, then tray again. The plaster nippers may also be used to remove the plaster/pumice.

TRIMMING OF THE MASTER CASTS

1. The bases are parallel to the projected plane of occlusion;
2. The bases are 12 to 15 mm thick in the thinnest portion;
3. A minimum of 3mm of land area remains - are smooth and flat
4. Vestibular depth is maintained at 3 mm.
5. Grooves have been placed for indexing.

POSTERIOR BORDER AND POST-PALATAL SEAL

If you are treating an actual patient, you would now prepare the posterior border and post-palatal seal: When treating an actual patient, BUT NOT IN THIS LABORATORY EXERCISE at this time.



Chapter 9

POSTERIOR PALATAL SEAL

To be able to define a post dam, list its purpose and list its types in writing. To be able to answer questions about the former on a written exam. To be able to prepare a post dam on the pre-clinic laboratory cast and baseplate and on a clinical case. To be able to demonstrate or delineate the post dam area on a patient.

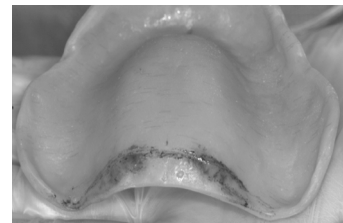
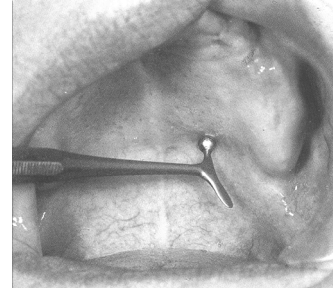
1. Gently dry the tissues in the posterior palatal seal and pterygomaxillary notch with a gauze sponge.
2. Locate the pterygomaxillary (hamular) notches with a T burnisher by passing it posteriorly along the crest of the ridge until it drops into the notch. Mark the notches with the indelible marker.
3. Locate the vibrating line by having the patient say a series of short "huh" and mark it in the mouth with the indelible marker(Dr. Thompson's color transfer applicator). Mark the area of the soft palate where movement just begins.
4. Palpate the tissue anterior to the vibrating line with the ball end of the T-burnisher. Examine the thickness and displaceability of the tissue. The anterior border of the post palatal seal area is also marked to define the most anterior boundary.

These lines could be captured

- a. Mark the line prior to final impression, the impression material will pick up the marking
- b. after the impression process, mark the line and re-insert the impression to transfer the line.

(THIS IS THE CORE TECHNIQUE USED IN NSU CDM PRE-DOC CLINIC).

- c. at the final try-in visit , use the record base to transfer



the line.

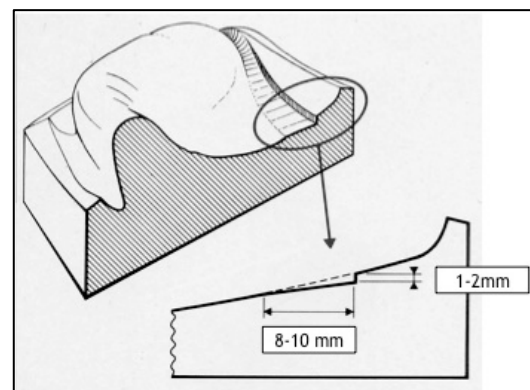
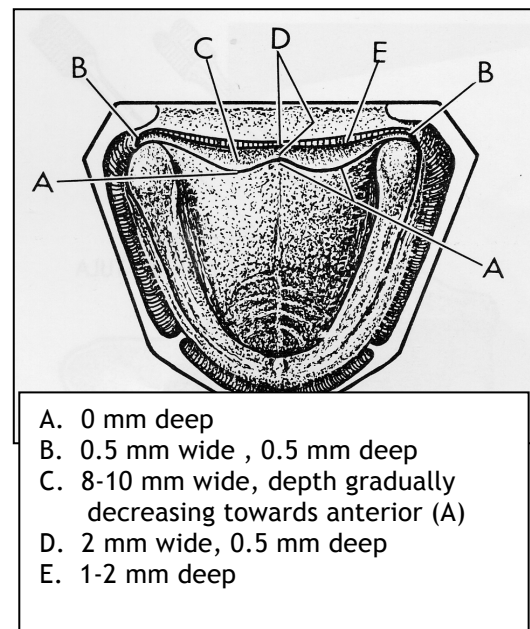
4. Insert the dried final impression in the patient's mouth and seat it fully. Visually observe the relationship of the impression to the line marked in the patient's mouth. Ask the patient to tilt his head down and swallow and/or say a series of short "huh"s.
5. Remove the maxillary impression. The indelible markings of the vibrating line and the anterior border may have transferred to the record base. If the line has not transferred to the impression, re-mark the lines and re-insert the impression and instruct the patient to blow through his or her nose while you gently pinch it shut.
6. The impression is then re-defined with the indelible marking stick and proceed to the disinfection process. You might need to re-mark it again right before pouring the impression after boxing.)

(STEP 7-8 describe the procedures when the record base is used to transfer the vibrating line)

7. Trim the posterior border of the record base to the transferred marking using a bur designed for trimming acrylic. Reinsert the record base in the patient's mouth and evaluate the relationship of the posterior border to the vibrating line. Adjust until the correct length is obtained. The fovea palatine are not reliable indicators of the location of the vibrating line.

8. Place the maxillary record base on the cast. Scrape a line into the cast, marking the posterior border of the record base using a sharp instrument. Extend this line approximately 3 mm beyond the crest of the pterygomaxillary notch continuous with the disto-buccal border. This marks the posterior limit of the denture.

9. Using a pencil, outline the posterior palatal seal on the cast. The generally accepted outline is a butterfly or mustache pattern. The average dimensions are 2-3 mm in the



midline and distal to the tuberosities. A width of 8-10 mm is appropriate for the intervening areas between the midline and pterygomaxillary notches. The seal should be deeper posteriorly becoming more shallow as it extends anteriorly. It should be rounded and smooth in contour.

10. Scrape the master cast using a discoid/cleoid to the proper depth. This is usually one-half the depth the ball of the T-burnisher displaces the tissues. The deepest part of the posterior palatal seal usually is placed on either side of the midline where the seal approaches the hamular notches. This is generally in the range of 1.0 - 1.5 mm in depth.

Heat polymerization of the denture base acrylic results in the resin pulling away from the cast in the posterior palatal seal area during denture processing. It should be a distinct line that the technician can clearly read. It is better to error in favor of a deeper post palatal seal than one which is too shallow because a moderately excessive seal can be easily adjusted with a pressure indicating paste at the insertion appointment.

CHAPTER 10

RECORD BASES and WAX RIMS

Instructions for Laboratory Procedures

LAB Session 4

FABRICATION OF RECORD BASES AND WAX RIMS

a. Examine the microstone maxillary and mandibular final cast. Accentuate the posterior border of the palate, with a Dr. Thompson's Color Transfer Applicator dampened

with water to release the blue pigment.

b. Blackout: carefully note the ridge undercuts when looking directly down on the cast. These undercuts exist on the labial surface of the alveolar ridge from right and left canine areas to the midline - labial frenum area and in the left tuberosity area. They must be blocked out to enable a path of insertion and withdrawal of the rigid Triad base. Lightly outline the undercut areas with a black pencil. BLOCK out these undercuts with medium pink baseplate wax applied to the cast, using the wide end of a number 31 wax spatula heated smoking hot. Block out only the undercut area. Do not over-block the undercuts, either in thickness or extent of the baseplate wax blackout.

Excess blackout will compromise the close fit of the record base and reduce its retention in the mouth.

It is possible to use the surveyor for accurate blackout . First scribe with the surveyor lead the labial-buccal height of contour of the ridge with the cast tilted at the most favorable path of withdrawal. Opposite the facial height of contour of the ridge, just apical to the undercut area and inside the peripheral roll of the denture border draw a line with a pencil and complete the outline of the undercut. Block out as described with medium pink baseplate wax and remove the excess with the surveyor wax knife or with a hand-held plaster knife.

c. Triad record bases:

- Coat the blocked out cast with model release agent(MRA) or petrolatum, thinly applied with a cotton-tipped applicator.

- Remove a sheet of pink Triad base material from its wrapper and apply it carefully to the maxillary Microstone master cast
- Adapt the posterior border of the sheet conform as closely as possible to the blue line on the cast marking the posterior border of the denture. Avoid trapping air in the palate by laying the Triad sheet down gradually from the posterior border toward the anterior. Using the fingers or the Triad modeling instrument lubricated with petrolatum or model release agent, GENTLY adapt to the palate first before the ridge and peripheral borders. Avoiding excess pressure will help keep you from making the Triad too thin, especially over the ridges .
- Use the modeling instrument to fill the peripheral roll area with Triad.
- With a scalpel blade cut away the excess Triad from the facial border areas and posterior border of the denture base area.
- To prevent curing distortion of the palate, cover the palatal Triad with a palate-shaped section of the opaque Triad wrapper cut out with scissors. This will prevent initial curing of the palate as the rest of the base cures.
- Place the maxillary Microstone master cast with the adapted pink Triad base material in the Triad curing unit and cure for 1 minute. Then remove the opaque wrapper section from the palate, re-adapt the uncured Triad to the palate with a lubricated/finger and cure for 2 more minutes.
- Gently remove the Triad base from the cast, coat the entire base with thin layer of the air barrier coating (ABC), replace the base in the unit tissue side !:!.Q and cure for 3 minutes additionally. Then remove the water soluble air barrier coating with brush or gauze pads and water.
- Make a second maxillary Triad base on the maxillary Microstone master cast.
- Trim and smooth the Triad bases to the borders outlined on the casts with acrylic resin trimming burs in a slow speed straight handpiece or an

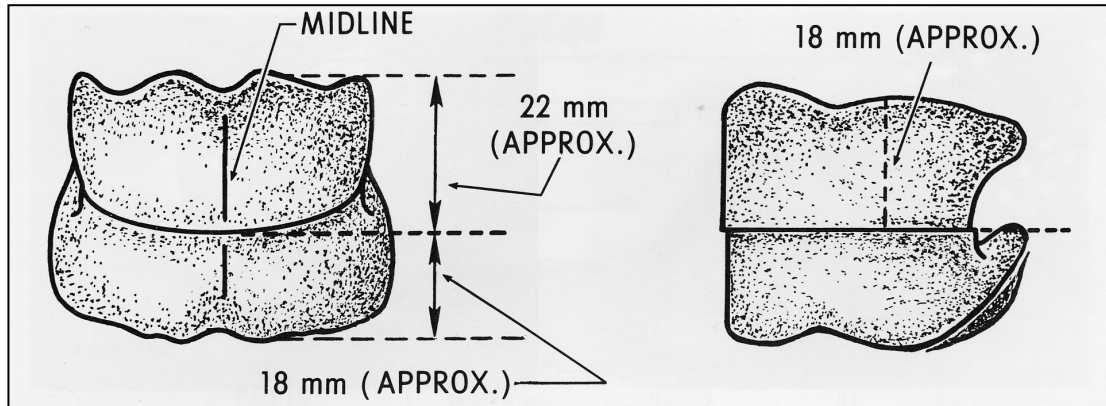


arbor band in the laboratory lathe rotating at 3000 RPM.

- In order to increase efficiency during denture teeth arrangement process, certain area should be thinned out prior to the construction of the wax rim. Use a #4 round bur as the depth guide. Do not perforate the record base, 1 mm thickness of the record base should be preserved in this thinning out area to ensure the structural durability of the base. Buccally- 4-5 mm of the peripheral roll in your Triad record base should be preserved. Posteriorly- this area should be extended to 2/3 of the tuberosity in the maxillary arch, and to the lower border of the retromolar pad in the mandibular arch. Lingually-5 mm beyond the height of the ridges
- DO NOT POLISH THE TISSUE (INTERNAL) SURFACE and this relieved area.

WAX OCCLUSION RIMS

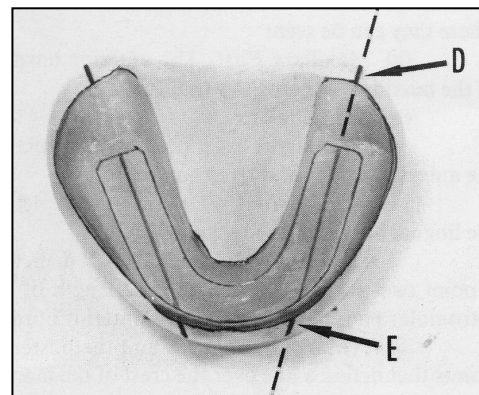
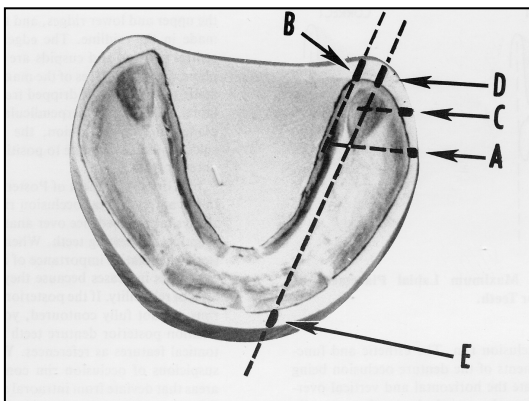
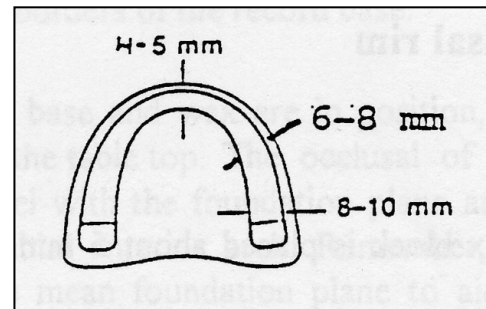
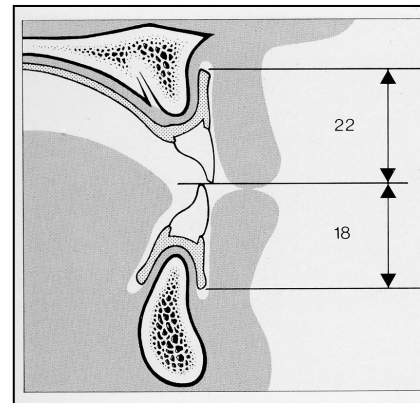
1. Sticky wax is applied to the previously prepared thinned out area of the record base.
2. A sheet of baseplate wax is warmed over the Bunsen burner.
3. Starting from one side first, the wax is folded into a square log of wax. During the folding process, make sure the wax sheet is evenly heated / soften before folding.
4. The soft log of wax is bent and placed on the record base, centered over the crest of the ridge where the sticky wax was applied. A hot spatula is used to heat the sticky wax right before the placement of the wax log. The arch form should be used as reference for the wax rim buccal contour.
5. A HOT spatula is used to seal the baseplate wax to the record base.
6. A heating plate is heated over the Bunsen burner. Do not overheat the plate. Gently apply the plate to the occlusal surface and sweep the plate from side to side to create a flatten occlusal surface. Place paper liner or towel to allow the wax to drip from the side to the plate. **DO NOT DRIP THE WAX ON THE BENCH, CHAIR, FLOOR..., WE WILL MAKE YOU CLEAN IT UP!!** The heating plate should be cleaned with paper towels constantly to prevent residue build up.
7. If necessary, fill in the buccal/facial surface with wax to eliminate voids and concavities Surface.
8. Use the #4R spatula (for mixing the dental stone) to smooth the facial and buccal surfaces of the occlusal rims.
9. #31 wax spatulas are used to smooth the lingual surfaces of the occlusal rim.



DIMENSION OF WAX RIMS

MAXILLARY:

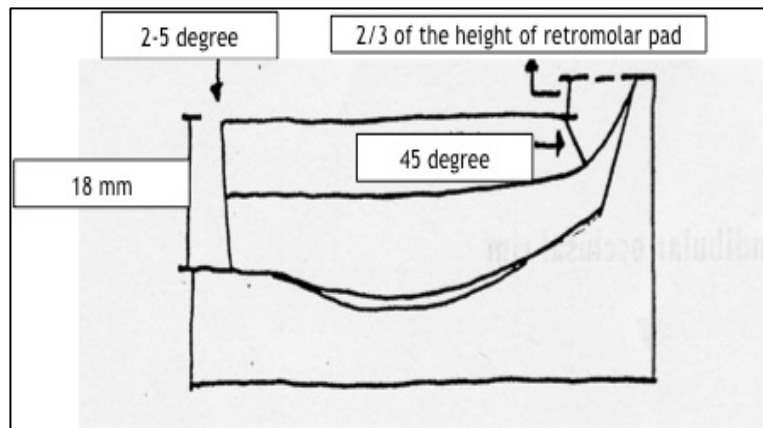
1. Terminate 1/2 of the tuberosity
2. Occlusal plane parallel to base of cast
3. 18 mm high at molar area (measured from the flange in the deepest portion of the buccal vestibule, anterior to the tuberosity, to the occlusal surface of wax rim)
4. 22mm high at anterior (measured from the flange in the deepest portion of the labial vestibule to occlusal plane)
5. 10mm wide at molar area
6. 4 -6mm wide at anterior area
7. 5-10 degree anterior flair towards facial
8. 45 degree angle at posterior end
9. The center of wax rims in the posterior section coincide with the crest of the ridge.
10. From canine to canine (the anterior or labial segment of the arch) the palatal side of the occlusal rim should be just palatal to the crest of the ridge and the labial surface should be adapted so that there is a smooth facial surface from the border of the record base to the occlusal surface of the rim.



MANDIBULAR:

1. Terminate just anterior to retromolar pad
2. Occlusal plane parallel to base of cast
3. Distal occlusal height even with $\frac{1}{2}$ to $\frac{2}{3}$ the height of retromolar pad
4. 18mm high at anterior (frenum to occlusal plane)
5. 10mm wide at molar area
6. 4mm wide at anterior area
7. 2 degree incisal flair
8. 45 degree angle at posterior end
9. The center of wax rims in the posterior section coincide with the crest of the ridge

Chill the wax rim in cool water then polish the wax with a wet tissue, wet towel, or a pad of wet cotton torn from a cotton roll.



Practice Pearl: when the maxillary and mandibular occlusion rims are in occlusal contact in the patient's mouth, the distance from the lowest point on the border of the mandibular record base to the highest point on the border of the maxillary base (generally the lateral incisor - canine area) is 40mm.

Practice Pearl: An imprecise but very useful measurement: from the center of the incisive papilla to the labial surface of the maxillary central incisor (and the labial surface of the maxillary wax occlusion rim) is 5-8 mm.

CHAPTER 11

MAXILLOMANDIBULAR RELATIONS

We learned from the discussion of occlusion course, mandibular movements are complex in nature and vary greatly. Many different mandibular movements occur during mastication, speech, swallowing, respiration, and facial expression. It is essential for us to be familiar with the mandibular movements in order to:

- Understand various aspects of occlusion,
- Arrange artificial teeth,
- Select and adjust recording devices and articulators, and
- Make necessary changes to accommodate the inherent discrepancy.

There are 4 determinants of mandibular movements (Please refer to Chapter 16 in Zarb's Textbook)

(1) Influence of the TMJs	(3) Masticatory Muscles
(2) Influence of the opposing tooth contacts	(4) Neuromuscular control

Since the occlusal contact factors were lost and need to be reestablished for the edentulous patient. One of the challenges of rehabilitating edentulous patients is to restore the original maxillo-mandibular relation. There are differences in the natural dentition and the artificial denture teeth.

Natural Dentition occlusion	Denture teeth articulation
Retained in PDL	Mobile bases on mucosa
Units move independently	Teeth move as an unit
Malocclusion effects not immediate	Malocclusion affects entire base immediately
Non-vertical forces affect only teeth involved and usually well tolerated	Non-vertical forces affect all teeth and is traumatic
Incising doesn't affect posteriors	Incising affects all teeth attached to base
Bilateral balance is rare	Bilateral balance is often desired for base stability
Tactile sensitivity	Decreased tactile sense

This is the reason why, it is called “interocclusal record” in dentate patient; and in complete denture prosthodontics, it is called the “maxillomandibular relation record” instead.

Let’s review some key concepts related to the maxillomandibular relation of complete denture prosthodontics.

Maxillomandibular relation record: a registration of any positional relationship of the mandible to the maxillae. These records should be obtained while the condyles are rotating around the true hinge axis. It should be a **repeatable, stable, physiologically acceptable** registration. It contains vertical, horizontal or lateral components of the 3-dimensional relationship.

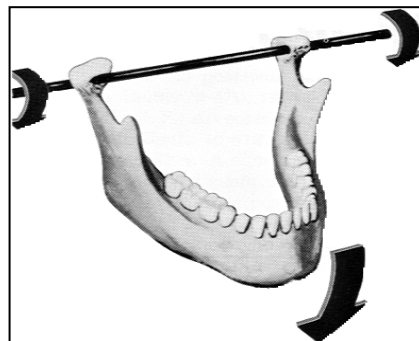
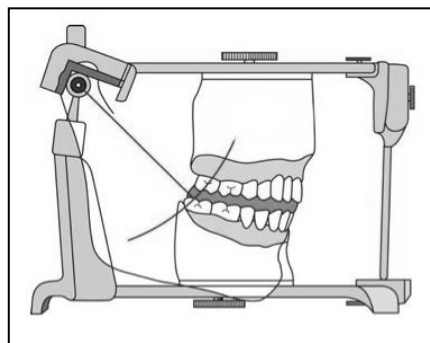
Once the wax rims have been constructed prior the third appointment.

Modifications have to be made to the rims to meet the esthetic and functional requirement in the beginning of the 3rd visit. The accurate maxillo-mandibular relationship should be recorded and transferred to the articulator. There are several important definitions relating to this exercise.

Hinge Axis: A hypothetical line through the two mandibular condyles around which the mandible may rotate within the sagittal plane. If the hinge axis has been properly transferred, an accurate

CR record will orient the lower cast to the opening axis of the articulator in the same relationship as the patient’s mandible relates to his/her opening axis. CR should be made at or very close to the selected VDO when an arbitrary face bow is used.

Vertical Dimension-The measurement made between 2 stable landmarks, usually the tip of nose and chin. The vertical dimension is measured either at physiologic rest position(VDR) or when the patient is in the maximum intercuspation relation(VDO). This measurement provides the information relating to the VERTICAL component of maxillo-mandibular relation during the construction of complete denture prosthesis.



Vertical dimension of occlusion - The distance measured between two points when the occluding members (upper and lower Occlusion rims) are in contact. It is about 2-3mm less than Vertical Relation at Rest Position.

Vertical Dimension at Rest (VDR)

The measurement obtained while the opening & closing muscles of the mandible are at rest in tonic contraction. Mandible is in physiologic rest position. The patient might have the teeth extracted many years ago, but the pattern of jaw movement, transverse axis, and vertical dimension could still remain unchanged.

Rest Position: A postural position. It is dependent upon various factors such as health, age, emotion and body posture.

Freeway space (interocclusal rest space IRS)--The clearance presents between the maxillary and mandibular occlusal surface of patient's dentition while the mandible is at rest position. The condyles are in a neutral unstrained position in the mandibular fossae.

$\text{VDR} = \text{VDO} + \text{Freeway space (2-4 mm interocclusal rest space)}$

Centric Occlusion(CO):

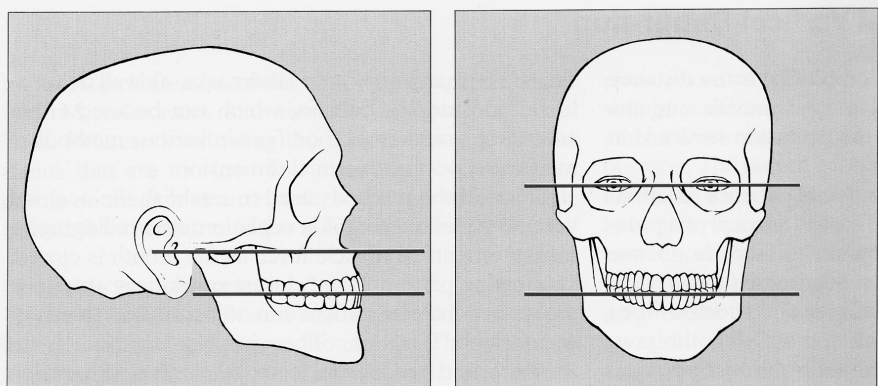
Definition: the occlusion of the opposing teeth when the mandible is in centric relation. This may or may not coincide with the maximal intercuspal position

Centric Relation(CR):

Definition: a maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective discs with the complex in the anterior-superior position against the slopes of the articular eminences.

Centric occlusion with teeth present is a **tooth-to-tooth relation**, whereas centric relation, a static position, is a **bone-to-bone** relation.

Camper's plane - A plane established by the inferior border of the right or left ala of the nose and the superior border of the tragus of both ears.



NSU Procedure steps for complete denture-

Visit 1	Diagnosis, Treatment plan, preliminary impressions
Lab work in between Visit 1 and 2	Pour impressions>>Diagnostic casts Fabrication of custom trays
Visit 2	Border molding the custom trays Final impressions
Lab work in between Visit 2 and 3	Box and pour the impressions>> Master casts Carving the post palatal seal Record bases and wax rims
Visit 3	☐ Adjust, modify, and finalize the dimension of wax rims to provide proper lip support ☐ Verify occlusal plane orientation ☐ Determine vertical dimensions(VDO, VDR) ☐ Marking mid line, determine inter-canine distance, ☐ Face bow registration ☐ Centric jaw relation registration ☐ Denture teeth shade selection
Lab work in between visit 3 and 4	a. Face bow transfer to mount the maxillary cast b. Mounting of the mandibular cast c. Finalize teeth selection and request denture teeth d. Arrangement of the anterior teeth
Visit 4 (OPTIONAL)	Verify jaw relation/ mounting Anterior denture teeth setup try-in
Lab work in between visit 4 and 5	Arrangement of the posterior teeth
Visit 5	Posterior denture teeth arrangement try-in Verify post palatal seal Consent
Lab work in between visit 5 and 6	Final Festooning (wax contouring) Preserving the face bow with remount index Sent to the lab for acrylic process Lab remount
Visit 6	Clinical remount Delivery
Visit 7, 8	post insertion adjustment

CHAPTER 12

THE ARTICULATOR AND FACEBOW

Articulator - A mechanical device that represents the temporomandibular joints and jaws, to which maxillary and mandibular casts may be attached to simulate some or all mandibular movements. The outer limits of all excursive movements made by the mandible are referred to as border movements. The more closely the articulator is able to reproduce these border movements of the mandible, the more closely it will reproduce the posterior determinants of occlusion (Right and left temporomandibular joints). This clinically will result in harmony between the patient's masticatory system and the fabricated restoration.

Classification of Articulators

Classification based ability to reproduce mandibular movement	Classification based on design
Non Adjustable	Arcon
Semi-adjustable	Non Arcon
Fully-adjustable	

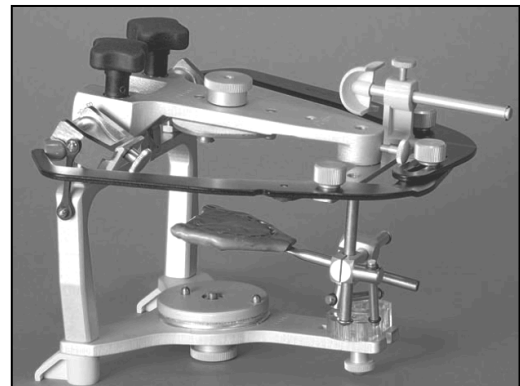
Semi-adjustable articulators – The construction of a complete denture prosthesis requires the articulator to produce similar range of motion as the mandibular movement. The semi-adjustable articulator is generally a larger instrument than most non-adjustable articulator. Usually the intercondylar distances settings on semi-adjustable articulators are preset at 110 mm. The instrument allows for the adjusting of condylar inclination. Other adjustable features include: condylar inclination, Bennett angle, and in some instruments immediate side shift. These features allow the instrument to reproduce the patient's actual mandibular movements more accurately. The condylar movements are represented as straight paths and the articulator can only duplicate the direction and endpoint, but not the intermediate track of some of the condylar movements. Since the complete denture teeth articulation is designed to follow a more linear path, a semi-adjustable articulators is a good choice of instrument for denture teeth arrangement and remount procedures.

Arcon and Non-arcon articulators

There are two basic designs used in the fabrication of articulators: Arcon and Non-arcon. Arcon articulators have the condylar element placed in the lower member, and the mechanical fossae are placed in the upper frame of the articulator. This design represents the actual condylar and glenoid fossae locations in the skull. In a non-arcon type of articulator the condylar path simulating the glenoid fossae placed in the lower member of the instrument while the condylar elements are placed on the upper portion of the instrument. In complete denture fabrication, there are no major differences in the choice of these two designs of articulator.

YOUR Whip Mix® 4640 Articulator

- Tracking fossae allow upper and lower frames to remain together during excursive movements.
- (Model 4641 is identical to the Model 4640 Articulator, but offers a modified type of condylar guidance. Each condylar guide assembly has the lower wall reduced which allows the articulator to function like an open fossa articulator during excursive movements, and a closed tracking articulator during simple hinge movement.)
- “Accumount” System of Interchangeability which allow accurate interchanging of casts between articulators
- Fully open access from the lingual position for easy access during denture setup (This allow us to verify the contacts of denture teeth articulation)
- Easy to operate Locking mechanism provides the following actions:
 - Allows removal of upper frame from lower frame for cleaning and servicing the articulator
 - In the locked position it provides a quick way to return to centric position and locks the articulator for added stability
 - In the mid-range position the locking mechanism allows the condylar ball to move freely down



the track of the condyles during excursive movements

- A Support Rod to support the upper frame of the articulator when open
- Condylar guidance featuring:
 - Adjustable condylar inclination
 - Adjustable progressive side shift
- Fixed intercondylar distance of 110 mm

Facebow Transfer and Hinge Axis Location

Hinge axis (Transverse horizontal axis) -

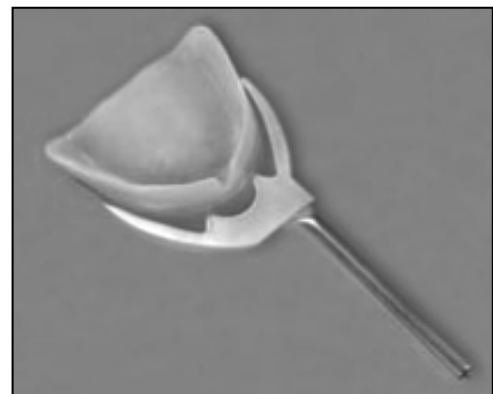
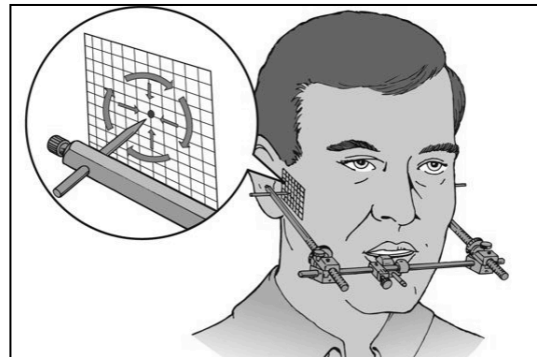
an imaginary line through the two mandibular condyles, around which the mandible may rotate within the sagittal plane without translatory movement.

Rotary movement for the opening and closing of the mandible usually occurs within a range of 2 to 2.5 cm of the hinge axis. By

duplicating the patient's hinge axis with the condylar axis of the articulator, the instrument can simulate the functions of opening and closing movements.

Facebow - A caliper-like device, which is used to record the relationship of the maxilla to the temporomandibular joints. This is a relationship between the jaws and the axis of movement.

The instrument you are using is Whip Mix® Model 8645 "QUICKMOUNT" FACE-BOW. Three reference points are used, the two external auditory meatus of the ears and the bridge of the nose. This type of design is easier to manipulate clinically than holding the condylar rods over the hinge axis markings while the bite fork is tightened in position. An average distance from the external auditory meatus to an arbitrary hinge axis is built into the face bow design. This



distance is compensated for in the articulator by offsetting the mounting points an equivalent amount.

For complete denture prosthodontic treatment, the fork of the arbitrary face bow is attached to the maxillary occlusion rim, so the record is a simple relationship between the upper jaw and the approximate axis of the jaw opening.

Maxillo-mandibular relation records

After the maxillary cast has been accurately affixed to the articulator by using a face bow, the mandibular cast must be oriented to the maxillary cast with equal exactitude to be able to diagnose the patient's occlusion.

Centric relation records are used to replicate, on the articulator, the relationship between the maxillary and mandibular arches that exists when the condyles are in their most antero-superior position in the glenoid fossae.

The benefit of using centric relation as the restorative position for complete denture patients:

1. Conducive to health – Less strains and stress to TMJ and muscles
2. Relatively repeatable - so the patient can find stable occlusal contacts easily
3. A hinge position - allows change in the vertical dimension easily and so the patient can find stable occlusal contacts easily
4. A relatively symmetrical position - avoids muscle strain which might occur in excursive positions

Protrusive interocclusal records are used to adjust the condylar guidance as well as the anterior mechanical incisal guide table of the articulator. The protrusive records are then used to set the condylar guides to approximate the anatomic limits of the temporomandibular joints.

CHAPTER 13

CLINICAL VISIT # 3

JAW RELATION AND TEETH SELECTION

TRY IN AND MODIFICATION OF THE WAX RIMS

The purpose of this procedure is to provide acceptable wax rims and base plates in order to:

- To verify the fit of the maxillary and mandibular record bases.
- To establish esthetic labial and buccal contours.
- To establish the occlusal plane.
- To mark the mid-line, high lip line, and cuspid-to-cuspid distance.
- To measure rest relations.
- To register the vertical dimension of occlusion and centric relation.
- To mount the maxillary cast on the articulator in a manner which relates it to certain cranial landmarks.

Instruments and Materials

1. Mouth mirror	2. Micro torch or Bunsen burner
3. heating plate	4. laboratory knife
5. Fox plane	6. Dental floss
7. Flexible ruler	8. Tongue depressor
9. Boley gauge	10. #31 wax spatula
11. Face bow assembly	12. Wax spatula #7
13. Wax knife	14. Indelible pencil (Thompson's marker)
15. Baseplate wax	16. Sticky wax
17. #4R spatula	

-

PROCEDURE:

STEP 1: Confirming the Posterior Border of the Maxillary record base -

Place the maxillary record base in the patient's mouth. Make sure the base plate is providing retention, stability, and comfort to the patient. The position of the posterior border of the maxillary record base should be at the junction of soft and hard palate, which is the vibrating line. The border of the record bases should provide intimate contacts to the soft tissue and form the peripheral seal.

STEP 2: Establishing Esthetic Labial and Buccal Contours:

Once the base plate is seated and adjusted to the proper posterior extension, the final labial contour of the maxillary denture is established by altering that surface of the wax rim. Observe the facial contours from both the front and side views, with or without the maxillary wax rim in the patient's mouth, the philtrum should present natural appearance. If necessary, reshape the facial surface of the rim until the desired contour is achieved. Observe the relationship of the rim to the relaxed upper lip. Approximately 2 mm of upper wax rim should be visible in the average patient. Patients are encouraged to bring old photos taken with natural teeth showing while smiling. Some patients may not show any wax at rest because they have long upper lip.

STEP 3: Establishing Plane of Occlusion

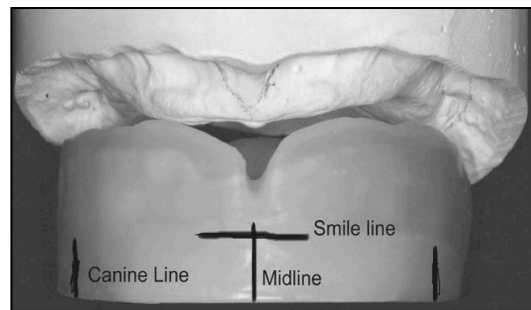
Use the Fox plane to align the antero-posterior orientation for the plane of occlusion to parallel to the Camper's plane (ala-tragus lines). From the frontal view, the plane is parallel to a line drawn between the pupils of the eyes (the interpupillary line). A tongue blade is used to help you to visualize the lines. Trim or add wax to the wax rim to achieve this relationship. Use the heating plate carefully without altering the anterior dimension. Now have the patient say words containing "F" and "V" sounds such as 55, 44. The anterior section of maxillary wax rim, which represents the incisal edges of the maxillary central incisors, should contact the inner surface of the vermilion border of the lower lip. This is also called the "wet-dry line" of the lip. If the maxillary rim does not contact the lower lip in this area, adding or removing wax must adjust the length of the anterior portion of the rim. This technique is also used to evaluate the proper anterior-posterior position of the maxillary incisors next visit (Visit 4: denture teeth arrangement trial visit). Evaluate lip support and adjust if necessary.

STEP 4: Establish and mark the Midline, High Lip and Cuspid Line:

With the maxillary wax rim in the patient's mouth, study the face from a front view. Divide the philtrum of the lip and mark this point on the labial surface of the wax rim with a #7 spatula. This is the midline of the anterior segment. This line is “facial midline “. The facial and dental midlines might not be identical!

The distal surface of the natural maxillary canine is usually located near the corner of the mouth and a vertical line dropped from the ala of the nose to the occlusal plane will often pass through the middle of the natural maxillary canine. These landmarks will provide an estimation of the position for the artificial canines and the width of six artificial teeth on a curve.

Direct patient to smile and make a horizontal mark at the lower border of the upper lip. This is the high smile line. This mark is used to estimate the length of a maxillary central incisor.



STEP 5: Marking/measurement of rest position

Vertical Relation (VDR and VDO)

Before obtaining the centric jaw relation, the maxillary and mandibular wax rims need to be adjusted to the proper vertical dimension. Since the centric relation is recorded as the condyles rotating along the axis. Vertical relation is crucial for the selection, arrangement as well as the outcome of complete denture. The physiologic rest position is the starting point from which the vertical relation of occlusion is established for the edentulous patient. There are several methods could be used in determining rest position:

A. The mechanical methods:

- Pre-extraction Records: Profile Radiographs
- Casts of Teeth in Occlusion
- Facial Measurements
- Ridge Relations: Incisive Papilla to Mandibular Incisors
- Parallelism of the Ridges
- Measurement of existing dentures.

B. The physiological methods:

- Physiological rest position,
- Swallowing threshold
- Phonetics
- Esthetics
- Tactile Sense and Patient-Perceived Comfort
- Testing the Vertical Jaw Relations with the Occlusion Rims

The use of esthetics and patient-reported comfort adds to the mechanical and physiological approaches to the problem.

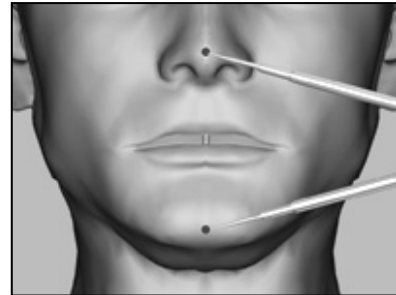
All estimates of the vertical dimension must be considered tentative until the teeth are arranged on their trial bases, and observations of phonetics and esthetics can be used as a check against the vertical relations established by mechanical or physiological means.

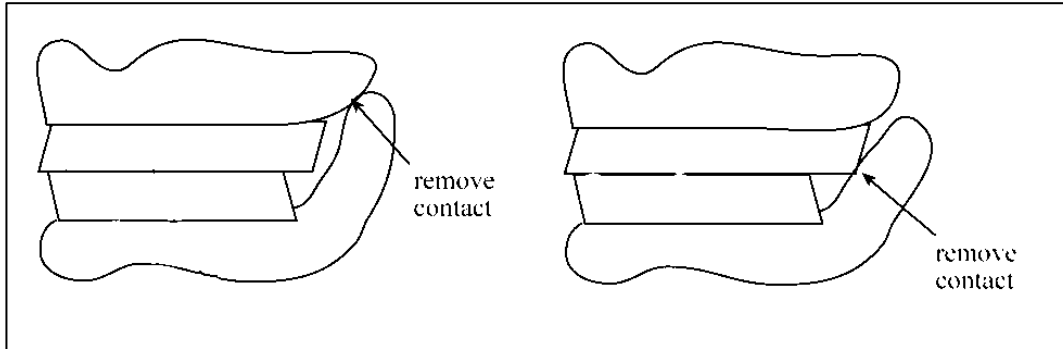
$$\text{VDR} = \text{VDO} + \text{Freeway space (2-4 mm interocclusal rest space)}$$

Rest position is the postural relation of the mandible to the maxilla when the patient is resting comfortably in the upright position and the condyles are in a neutral unstrained position in the mandibular fossae. With Thompson's stick, mark two small dots, one on the tip of the nose and the other on the chin at the midline. Direct the patient to sit upright, free of any back or head support and relax. Insert the upper contour rim. Ask the patient to count slowly from 1 to 10. Then direct the patient to moisten the lips and swallow. Measure the distance between the dots of with a ruler or a Boley gauge. Repeat the measurement several times until a consistent result is obtained. Make sure that the position of the chin point is not influenced by the mentalis contraction. Make a note of the rest position measurement. It will be used the registration of the vertical dimension of occlusion. The targeted VDO is established by an arbitrary reduction of 2-3mm from the vertical dimension at rest relation.

STEP 6: Mandibular Occlusion Rim Adjustment

- The mandibular wax rim should be centered over the middle of the ridge to maximize stability, which is usually compromised in the mandible
- The posterior height of the wax rim should intersect with a point 1/2 - 2/3 up the retromolar pad.
- The anterior height of the wax rim should be even with the corners of the mouth when the lip is relaxed
- The maxillary wax rim should have 1-2 mm horizontal overjet anteriorly and posteriorly when the patient is in a centric position.
- The patient should demonstrate unstrained lips, with the vermillion border showing
- Measure the distance between the dots at physiologic rest position and also at the occlusal vertical dimension. The patient should be sitting upright without head support – jaw position is affected by posture.
- The patient would be asked to open and close and relax until lips barely touch - physiologic rest position. Place a finger below the patient's chin, then have patient close until wax rims touch – you should feel movement of the mandible through the freeway space as a double check on the measurements you made.
- If insufficient interocclusal distance is present- remove wax from one or both of the rims.
- Use large wax formers, wax spatulas, and red-handled knife (scalpel) with Bunsen burner and torch to adjust rims.
- Rims should make flat contact evenly along the entire length of the occlusal surface. This is extremely critical. If the rims touch in one area first, the patient can be forced into an eccentric or strained position.
- Posterior prematurity could occur in (a) between wax rim and the heel of opposing record base (2) between the heels of the record bases. Articulating paper should be used to identify any potential centric interference.





STEP 7: VERIFICATION OF THE VERTICAL DIMENSION

There are 3 ways to verify the vertical relation:

a. VDO /VDR measurement

Let the patient sit comfortably, looking straight ahead. Insert maxillary and mandibular wax rims to verify the vertical dimension. Instruct patient to lick lips and swallow or say “Emma”. After these exercises, the lips will open slightly. Check the visible freeway space in between the rims. You can also place a tongue blade or a ruler with the marking of VDO and VDR right next to the markings on the nose and chin. You can observe the movement of the mandible bringing the chin point up to VDO marking and returning to the VDR.

b. Facial appearance

The rest position of the mandible affects the harmony of the facial muscles. An experienced clinician can use this as a further check of the vertical relations. If the mandible is over closed, the lips and the mandible appear protruded. If the mandible is held open from the rest position, a strained appearance can be evident when the lips are brought into contact. Observe your patient in the established rest position. He or she should appear neither strained nor suffer a loss of vertical face height. Ask the patient to swallow and see if he or she appears to strain to bring the teeth into contact while swallowing.

c. Phonetics

Speech movements can also be used to verify the vertical relations. The wax occlusal rims must contact evenly prior to evaluating the vertical relation of occlusion. The vertical relation of occlusion should now be verified using phonetics.

1. Place both record bases in the patient's mouth. Ask the patient to wet the upper lip with the tip of the tongue.
2. Ask the patient to say words with "S" sounds, such as Mississippi, 66, or count from 60-70.
3. Observe from the profile and frontal view that there is 1-2 mm of clearance between the incisal edges of the occlusion rims in the midline when the patient repeats the words containing "S" sounds. The space that exists when these words are said is called the closest speaking space. If there is a space of 1-2 mm between the incisal edges of the maxillary and mandibular occlusal rims in the midline when the patient says an "S" sound, there should be adequate interocclusal distance. If the occlusion rims contact when these words are said, then wax on the mandibular occlusion rim should be removed until this clearance is obtained.

When you are satisfied that the vertical relation of occlusal you have established is correct for your patient and your occlusion rims occlude evenly anteriorly and posteriorly, you are ready to record centric relation.

INADEQUATE INTEROCCLUSAL REST SPACE RESULTS IN-

- clicking of the teeth
- facial distortion, tense strained appearance
- difficulty closing lips
- difficulty swallowing
- soreness and discomfort under the denture
- increased ridge resorption due to trauma

EXCESSIVE INTEROCCLUSAL REST SPACE RESULTS IN;

- reduced interarch distance when the teeth are in occlusion
- overclosure is potentially damaging to the TMJ
- normal tongue space is limited
- facial distortion, chin is closer to nose, commissure of the lips turns down , lips lose their fullness, muscles of facial expression lose their tonicity, face appears flabby
- angular cheilitis is sometimes attributed to overclosure

STEP 8: CENTIC JAW RELATION RECORDS

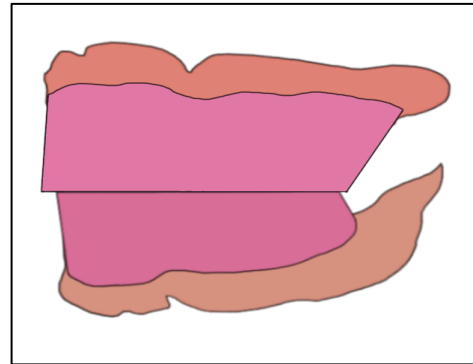
The primary requirements for making a CR record:

1. Record the horizontal relation of the mandible to the maxilla at the proper VDO.
2. Exert equal vertical pressure on the record base while making the record.
3. Avoid distortion of the record until the casts have been accurately mounted.
4. The relation record should be capable of being separated and rechecked in the mouth and must be stable and recognizably accurate in the horizontal, vertical and sagittal planes.

There should be equal bilateral vertical contact between the occlusion rims or opposing recording surfaces. The ideal recording medium is a freely flowing material that will allow bilaterally equalized pressure. The material should be rigid and stable upon setting. Quick-setting plaster, ZnOE Bite Registration Paste and Aluwax are three such acceptable mediums. PVS interocclusal record materials are not suitable for complete denture jaw relation record due to the flexibility and prolong setting time.

CLINICAL PROCEDURE:

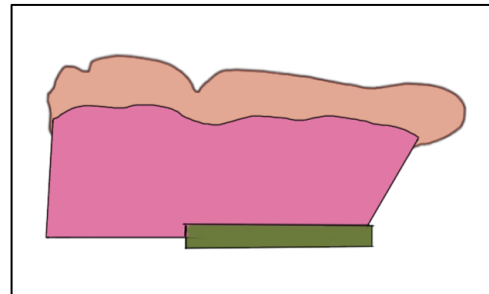
1. Wax is removed from the maxillary wax rim (2mm in depth) from the first bicuspid area back. The platforms on the maxillary rim are then scored with a knife so the registration medium (Aluwax) will adhere to these areas.



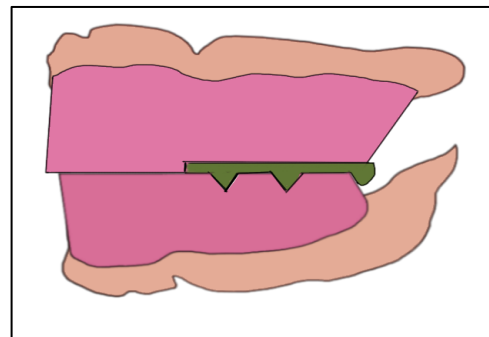
2. . Place indexing grooves, 2 each on each side slightly angulated between the 2nd premolar and 1st molar area, 2 mm deep and 2 mm wide. The surface of the wax rim and the grooves were lubricated lightly with Vaseline so that it will separate easily.



3. 3 layers of Aluwax is placed in the areas where the base plate wax are removed and built up to a level of at least 2 mm above the occlusal plane. Heated wax spatulas are used to soften the Aluwax evenly to a “Dead soft “ consistency. This will allow the clinician enough time to insert the record base and to guide the closing movement of the patient to reach the centric jaw relation. When the wax is in the proper consistency, patient will be able to reach the proper vertical dimension with the least amount of resistance, which might deflect or dislodge the record bases.



4. Carefully place the record bases in the patient's mouth and slowly guide the patient into centric relation. Hold the mandibular record base in position with your index fingers when guiding the patient into centric relation. Wait for the material to set according to the manufacturer recommendations(30-45 seconds). The patient is instructed to stay closed and maintain the original vertical dimension in the centric relation position and the Aluwax is allowed to harden.



5. After the recording medium has set, remove the record bases from the mouth. Chill the records under running cold water in the sink. Use the lab knife to separate the heels of maxillary and mandibular record bases. The Aluwax should produce clear imprint of the mandibular grooves.
6. After the wax is completely hardened, excess wax is trimmed away from the registration area with a sharp knife. The centric relation record should be verified for its repeatability by re-insert these record bases and repeat the centric relation record movements to see if the wax record coincide with the grooves.
7. Place the maxillary base on the maxillary cast, gently place the mandibular cast into the mandibular baseplate. Check to see that the relationship is stable, there should be no contact between the heel portion acrylic bases, or master casts. Trim excess recording material carefully with a warm sharp knife blade.
8. The shade of denture teeth selected in previous visit should be verified again before patient left , so the teeth could be requested and arranged before next visit.

CHAPTER 14

**MOUNTING MASTER CASTS
AND RESTORING THE WAX RIMS**

Instructions for Laboratory Procedures

LAB Session 5

WARNING: The following steps should only be used in this simulation laboratory course ONLY. The maxillomandibular relation records of real clinical patients should be obtained with the procedures described in chapter 13. The mounting sequence is similar.

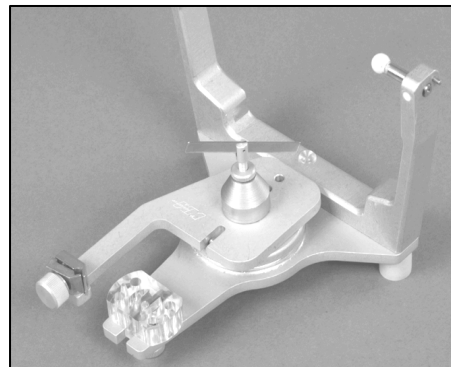
1. Make sure the maxillary and mandibular wax rims have been fabricated according to the specification outlined in chapter 10 (page 56-57).
2. Place the maxillary and mandibular record bases with wax rims on the casts. Mark midlines on the maxillary and mandibular wax rims with a sharp knife. These lines should coincide with the anatomical midlines of the casts.
3. Hand position the maxillary and mandibular cast with rims together, if the dimensions of the wax rims are accurate and the position of the casts are acceptable,
 - The base of the casts should appear to be parallel to each other.
 - The labial portion of maxillary wax rim should be have 2 mm horizontal overlap to the mandibular wax rim,
 - The buccal surfaces of maxillary and mandibular wax rims should be flush to each other.
 - The vertical distance of heel portions of the record bases should be 8-10 mm.
 - The measurement of the distance of the bases of both cast should be 65 mm
 - The measurement of the deepest point of facial flanges between the max and mandibular record bases should be 40 mm.
 - The midline of the casts should line up when view anteriorly and posteriorly.

4. Once the casts have been “articulated” properly, heat your #31 spatula and cut bilateral marking grooves 3 mm deep from the buccal surface distal to the canine area of both rims. These grooves will serve as references as you are obtaining the Aluwax registration.
5. Following the procedures in chapter 13, page 73-74 steps 1-6.
6. At this point, the marking grooves should be indicating the same relation is maintained throughout the process.

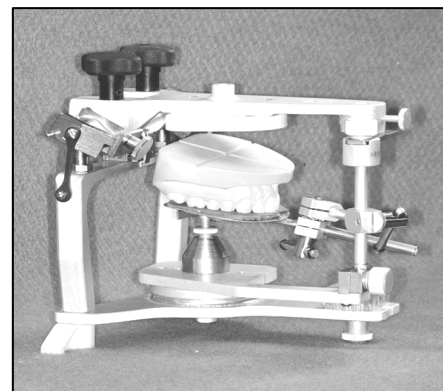
Mounting the Maxillary Cast on the Articulator

1. Set the condylar housings of the upper member of the articulator at the FB marking. Place the adjustable incisal guide table on the lower member of the articulator.

2. Attach the indirect mounting jig for WHIP MIX face bow to the magnetic face-bow fork to the lower member of the articulator. Tighten the lock, so that the face-bow is securely attached to the lower member of the articulator.



3. Attach the facebow fork to the maxillary wax rim as described in the previous chapter. Secure the maxillary cast and the record base in the face-bow fork record. Adjust the T screws until the base of the maxillary cast parallel the upper member of the articulator. Make sure that there is a 10 mm space exists between the mounting plate and the top of the maxillary cast when the upper member of the articulator is closed. As the facebow fork is in the correct position the cast support is raised to support the weight of the cast.



WARNING: This is something you would never do in real clinical patient ! You will not touch the T screws after the bow being removed from the patient. But in order to simplify our Sim lab exercise, we will mount the maxillary cast on this “fake bow”.

4. Apply a small amount of Vaseline to the center of the base of the master cast to facilitate separation from the mounting later.
5. Make a mix of mounting stone and attach the maxillary cast to the upper member of the articulator. The mounting should be smoothed and neatly finished.
6. After the mounting stone has reached an initial set, the face-bow assembly is removed. Remove the fork from the maxillary record base and check the integrity of the wax rim and make sure that the Aluwax record is not affected.
7. Place the previously mounted maxillary cast on the articulator. Place the metal incisal guide table on the articulator and set the chisel-shaped end of the incisal guide pin in contact with the guide table. The pin should be set at the plus 1 mm mark to accommodate the thickness of jaw relation record medium.
8. Place the record bases on their respective master casts and verifies that they are fully seated on the casts. Use sticky wax to attach the record bases to the casts. Lubricate a small area of the base of the mandibular cast with Vaseline. Attach the maxillary cast to the articulator. Invert the articulator. Use sticky wax and broken tongue blades to attach the two bases to each other to prevent shifting during mounting. (refer to the diagram on page 31)
9. Mix a small amount of mounting stone and place it on the base of the cast. Also, place a small portion of stone on the mandibular mounting rim. Close the articulator until the pin contacts the incisal guide table. Permit the stone to set. Be sure the balls of the condyles are fully seated in their respective fossae.
10. When the stone has completely set, remove the sticky wax from the articulator and further smooth mounting. If necessary, add more mounting stone. The mounting must be neat and clean.

11. Remove Aluwax from the wax rim and replace back the baseplate wax to allow an even occlusal plane with intimate contacts between the maxillary and mandibular rims. Make sure your mid line markings are not affected.

12. The mounted patient casts and both record bases and occlusal rims should be turn in on your Whip Mix articulator.

CHAPTER 15

ESTHETIC CONSIDERATION FOR THE EDENTULOUS PATIENT

The primary factor in selecting anterior denture teeth is the esthetic effect of the patient's total image. We are vitally interested in matching the size, shape, color, and arrangement of denture teeth to a person's anatomical measurements, face form, sexual characteristics, and age. Pre-extraction records are excellent guides to the patient's original teeth shapes and arrangement. The best kind of record is a plaster cast of the patient's dental arch made before the extractions were performed. Unfortunately, very few patients have these types of casts in their possession. However, most patients can provide a dentist with a full-face photograph showing natural teeth. In the absence of pre-extraction records, dentists and technicians categorize patients in various ways. Selecting, modifying, and arranging denture teeth are dictated by what usually holds true for the category of person. Selecting denture teeth for esthetic value centers on choosing the set's general size, shape, and color. Other than the pre-extraction records,

- Existing dentures-inquire about the patient's opinion about esthetic presentation of the current denture
- Patient's facial characteristics
- Patient's sex, personality, age(SPA)
- Arch size and shape
- Patient's preferences

Most manufacturers have followed the concept of dividing tooth moulds according to the basic shapes of square, tapering, and ovoid

Square Tooth Moulds:

With this angular shape, the central incisor is dominant and the gingivo-incisal curvature is moderate. The square facial shape offers maximum light deflection and creates a bold effect.

Tapering tooth moulds:

Characterized by rounded contours, which taper towards the cervical ridge.

Moderate gingivo-incisal curvature. Large triangular incisor slightly triangular in shape.

Ovoid tooth moulds:

The teeth have a pronounced gingivo-incisal curvature, which tends to disperse the light reflection and create a softened appearance.

Historically, more valid approach to tooth selection was first proposed as the Dentogenics concept (Frush and Fisher). They integrated the selection of teeth into an esthetic system governed by the sex, personality, and age (SPA) of the patient

a) Sex: male- rugged with square teeth & bold central incisors

female- pronounced curvatures, rounded point angles

b) Personality: vigorous or delicate

“Personality tooth”-the maxillary lateral incisors vary more in size, form and position than any other tooth

c) Age: Young- tapered, ovoid, rounded teeth

Middle- somewhere between young and old

Old- square, sharp corners

CLINICAL STEPS IN PREPARATION FOR SELECTING DENTURE TEETH

PURPOSE:

To select the proper anterior and posterior denture teeth which will fulfill the esthetic and functional requirements of the patient.

INSTRUMENTS and MATERIALS:

1. Wax rims and record bases
2. Tooth mold and shade guides
3. Flexible ruler
4. Large hand mirror

PROCEDURE:

1. The maxillary anterior denture teeth are selected according to size, shape, shade and material.

- a. Size:

Insert the maxillary wax rim, which was used to establish the tentative vertical dimension and centric relation. With the patient's facial musculature relaxed, indicate the midline of the face on the labial aspect by inscribing a line parallel to the mid-sagittal plane of the head with a #7 spatula. This line usually bisects the philtrum of the upper lip. it does NOT ALWAYS coincide with the labial frenum. Establish the level of the high lip line on the contour rim by asking the patient to smile broadly. This will aid in the determination of the tooth length. The width of the six maxillary anterior teeth is determined by using the following methods: 1) by dropping a perpendicular from the lateral surface of the ala of the nose. This indicates the center of the cuspid. 2) By marking the corner of the mouth with the lips relaxed on the contour rim with the #7 spatula. This indicates the distal of the cuspid. 3) By dropping a perpendicular midway between the ala of the nose and the pupil of the eye and marking it with the #7 spatula on the contour rim. This may also indicate the distal of the cuspid. These guides are used as a starting point for the selection of the maxillary anterior teeth. Variations may be made to suit the esthetic and biomechanical requirements of the patient.

Shade Selection

The two principal colors in teeth are yellow and gray. The clinical denture teeth shade guide is a Portrait shade guide for the definitive (2nd) set complete denture and Classic shade guide for the preliminary (1st) set. The Portrait shade guide combined 2 popular shade system: Dentsply Denture teeth shade and the Vita shade.

During shade selection appointment, aim to harmonize between color of the skin, hair and eyes. The following factors are important guide in preliminarily determining the shade:

1. Complexion
2. Hair color
3. Eye color
4. Age

5. Personality & activity
6. Patient desires
7. Denture care habit of the patient

Check the shade of the patient's existing denture and discuss their desires with respect to the tooth shade. Ask patient whether they would prefer the same shade or a shade that is lighter or darker.

Place the guide up against the patient's face and select a shade that blends with their skin tone, hair color and sclera/eye color.

By limiting the choice of shades to two or three, you can let the patient participate with you in the shade selection.

Once you have selected a color allow the patient to view it against their lip with a mirror. Obtain patient approval.

To summarize the visit # 3, at the conclusion of this visit,

- 1) You should have obtained a set of well-fitted, properly contoured record bases and wax rims.
- 2) The VDO and VDR have been determined.
- 3) The facebow registration, and centric jaw relation record are completed with the proper vertical dimension.
- 4) The midline, high smile line, low smile line and the lines indicating the distal of canines are clearly marked on the maxillary wax rim.
- 5) Shade and mould for the anterior and posterior teeth have been selected through a thorough data collection, analysis and discussion with the patient.

CHAPTER 16

DENTURE TEEETH SELECTION

- GENERAL DISCUSSION

A. DEFINITION:

Denture teeth are artificial substitutes for the coronal portions of the missing teeth. They are usually made of porcelain or plastic. Porcelain denture teeth contain various retentive devices such as platinum-iridium pins and diatoric holes, to secure them to the plastic denture base.

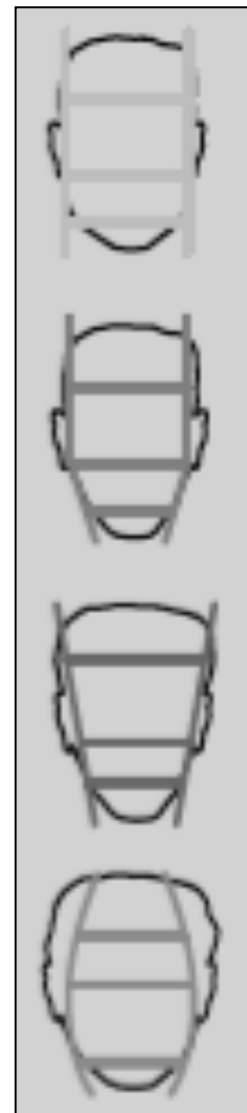
Here is an outline of the principles associated with selecting a set of anterior denture teeth for esthetic value:

Selecting Maxillary Anterior Denture Teeth:

Size. Denture tooth size is a combination of facial length and width. To estimate the maxillary central incisor length, you merely measure the occlusion rim between the occlusal plane and the high lip line. To find the collective width of the 6 maxillary anteriors, you measure the distance between the distal of the canines.

Shape (Mould). Research has proven that an inverted maxillary incisor tooth has roughly the same shape as the person's face, both in the profile and the frontal view. If you doubt this information, you can be assured that a tooth that approximates the shape of a patient's face looks good in that person's mouth. In profile, individuals have either flat or convex surfaces. In viewing people's faces frontally, four basic face forms and three subgroups have been defined.

1. Square (A Basic Form). The sides of the cranium, the condylar areas, and the angles of the mandible fall on more or less straight, roughly parallel lines.
2. Square Ovoid (A Subgroup of the Square Face Form). In this subgroup the character of the square tooth is softened making it



a more feminine tooth form.

3. Square Tapering (A Basic Form). The sides of the head are parallel from the condylar areas upward. The facial outline tapers toward the angles of the mandible from the condyles downward.

4. Square Tapering Ovoid (A Subgroup of the Square Tapering Form). In this subgroup the square tapering tooth is softened by a more rounded appearance. It is a more feminine tooth form.

5. Tapering (A Basic Form). The tapering face is widest at the height of the sides of the cranium. The sides of the cranium, the condylar areas, and the angles of the mandible fall on more or less straight, converging lines.

6. Tapering Ovoid (A Subgroup of the Tapering Form). In this subgroup the tapering tooth is softened by a more rounded appearance. It is a more feminine tooth form.

7. Ovoid (A Basic Form). The ovoid face is widest through the level of the condyles. The facial outlines curve inward above and below to form an oval. There is no subgroup for the basic, ovoid form.

SELECTING MAXILLARY ANTERIORS

First, determine the group of shape of you are using. Use the inter-canine width measurement with the measurements listed in the column of “Width of Anteriors on Curve/Flat” to choose available moulds. For example, your measurement is roughly 50 mm on curve. The shape your patient and you both choose Square Tapering group. You have 3 possible choices: 21X, 22E, and 22G.

Secondly, use the high smile line measurement to compare to the number listed in the column of “Length of Central w/o collar (mm)”. You try to make sure the patient would not have a gummy smile if the patient has a high smile line. In this case here, 22 G will be eliminated due to the short central length.

Thirdly, you will use the “Width of Central measurement” to select in between 21X and 22 E. 22E has a more slender look due to a narrower width.

In this manner you will obtain a maxillary anterior mould suitable in contour and size to the patient's face.

The Bioform Mould Classification System

Steps to Identify and Select Bioform Anterior Moulds

First Number

Step 1:

Using the classification from the previous page, select the number from 1 to 7 that best represents the patient's facial form.

The number selected is the first character of the mould identification number, located in the upper left corner of the tooth card.

Classification

1. Square
2. Square Tapering
3. Square Ovoid
4. Tapering
5. Tapering Ovoid
6. Ovoid
7. Square Tapering Ovoid



In the ovoid and ovoid combination forms, the mesio-distal aspect of the labial surface of the maxillary centrals is more or less round. In the square, square tapering and tapering forms, it is more or less flat.

Second Number

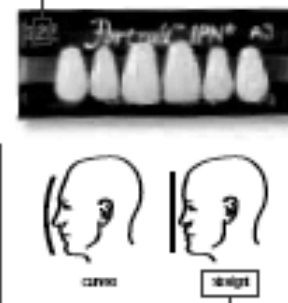
Step 2:

Using a flat device such as the Trubyte Tooth Indicator (#98981), select the number from 1 to 6 that represents both the proportion of the tooth (long, medium or short) as well as the facial contour (straight or curved).

The number selected is the second character of the mould identification number.

Proportion and Contour

- | Proportion of the Tooth | Facial Contour |
|-------------------------|----------------|
| 1. Long | Straight |
| 2. Medium | Straight |
| 3. Short | Straight |
| 4. Long | Curved |
| 5. Medium | Curved |
| 6. Short | Curved |



Letter

Step 3:

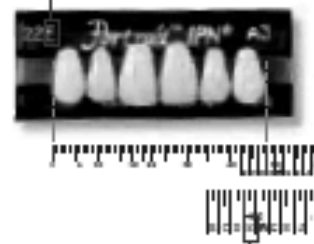
Using the Trubyte MM Ruler (Part #3496), measure the width of the upper six anterior teeth on the curve, from distal to distal.

The measurement will fall into one of the ranges identified with the letters B through J.

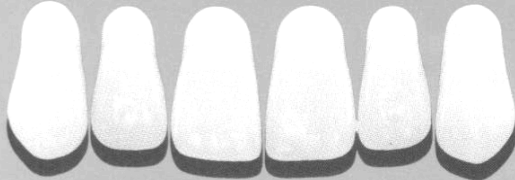
The letter selected is the third character of the mould identification number.

Width of Upper Six Anterior Teeth on Curve

- B. less than 44.00 mm
- C. 44.00 to 45.50 mm
- D. 45.50 to 48.00 mm
- E. 48.00 to 49.00 mm
- F/X. 49.00 to 51.50 mm
- G. 51.50 to 54.00 mm
- H. 54.00 to 56.00 mm
- J. 56.00 mm or greater



Some moulds may vary from this standard. Please consult mould chart dimensions.

Mould No. (lower Articulation)	SQUARE						Length of Central w/o Collar (mm)	Width of Central (mm)	Width of 6 Anteriors on Curve/Flat (mm)	Mould No.
11G (R)							11.10	8.75	52.00/ 48.00	22

Mould Number			Width of Central (mm)	Length of Central Without Collar (mm)	Width of 6 Anteriors on Curve/Flat (mm)
Articulation with lower mould					
133 (2C)			7.65	8.75	45.0 42.0

SELECTING MANDIBULAR ANTIRIORS

Use the mould indicated on the tooth selection chart in the Mould Selection chart.

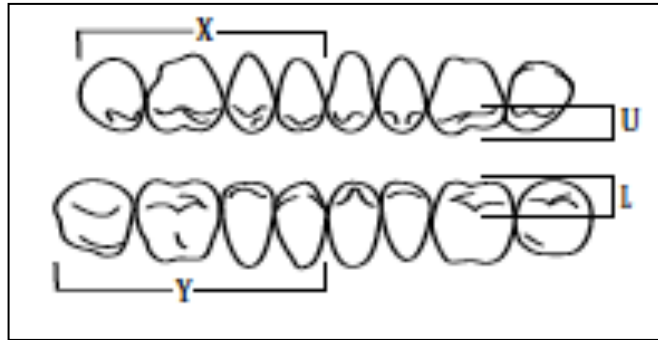
For example, if you selected mould number 22E, the proper mould for the mandibular anterior teeth for a patient with a Class I ridge relationship and jaw sizes that are in harmony would be lower mould "H". If the patient has a Class II ridge relationship and the jaw sizes are not in harmony, then the width of the six mandibular anterior teeth on the curve in a Class II situation should be less than the overall width if the anterior mould for a Class I patient. Therefore, a smaller mandibular mold must be selected. Conversely, if your patient has a Class III relationship, you must select a mandibular mold that would be greater in overall width than the mould indicated on the selection chart.

At this point you should have selected the maxillary and mandibular anterior denture teeth for your patient. You should have a proper anterior mold and shade. You are now ready to select posterior teeth.

SELECTING POSTERIOR TEETH

Posterior teeth are selected for their occlusogingival length, cuspal inclination, material, and shade.

1. Posterior artificial teeth are manufactured with cuspal inclines that vary from relatively steep to



flat. The most commonly used posterior teeth are those with cuspal inclinations of 33 degrees, 30 degree(Pilkington Turner teeth or PK), 20 degree, reduced cusp, or 0 degree.

33 degree posterior teeth offer the maximum opportunity for a fully balanced occlusion. 20 degree posterior teeth are semi-anatomic in form and wider buccolingually than 33 degree teeth. Non anatomic tooth forms provide little or no cuspal inclination. They may be indicated when Class II or Class III jaw relationships are present. Our simulation exercise will treat one edentulous patient with monoplane posterior teeth and one edentulous patient with 30 degree posterior teeth(1st set-project C4). We will also set the 2nd set- project C6 with monoplane posterior teeth. In lecture, we will introduce lingualized occlusion, which is using selecting anatomical teeth for the maxillary arch and non-anatomic teeth for the mandibular arch.

2. Mark a point on the crest of the mandibular ridge where the ridge inclines superiorly. This point is the maximum extent posteriorly that artificial teeth may be placed. When there is a sharp upward incline from the residual ridge to the retromolar pad, the denture will be unstable if teeth are placed posterior to the upward incline of the ridge. The most posterior placement of the artificial teeth is at the point where the incline begins. Use a ruler to measure the distance from this mark to the location of the distal of the canine tooth. This measurement in millimeters will give you the approximate size of the appropriate posterior mold.

For example, if your measurement is 32 mm, then the correct selection would be a mold that reads 32. Posterior teeth sizes generally are available in sizes like 29, 31, 33 (small, medium, large).

3. Observe the space available in the posterior region on the mounted master casts. The occlusogingival dimension of the posterior teeth should correspond to the interarch distance available between the mounted casts. If, for example, you had previously measured 32 mm of mesiodistal space available and you have observed that there was considerable interarch space available between the maxillary and mandibular ridges, you would select a mold that said 32 L. The letter "L" indicates a long occlusogingival length. If you had less interarch space available, then you would select a tooth that said 32 M. The letter "M" indicates a medium amount of occlusogingival length.

4. Material: Select either porcelain, acrylic resin or I.P.N. posterior teeth. There are indication and contraindications for the use of each. The final choice of material for a given patient is your decision. Acrylic teeth (and I.P.N.) are easier to adjust than porcelain teeth. This can be an advantage when much adjustment to the denture is necessary to arrange them. Porcelain teeth are more abrasion resistant than acrylic teeth. They are not affected by flaming the wax. The patient is much more likely to suffer a loss of vertical dimension due to occlusal wear with porcelain teeth. Porcelain teeth can fracture if the denture is dropped and click when the patient occludes. They are difficult to arrange if the patient has large residual ridges when much grinding is involved. Porcelain teeth don't bond to the acrylic resin denture base. Pins and holes hold them in mechanically. This makes it difficult to retain the teeth in the denture base. Consult your clinical faculty member for more information.

5. Use the anterior shade you have previously selected to obtain the proper shade for the posterior teeth.

The final selection of both anterior and posterior molds and shades should be entered in the patient's notes in Axium and the prosthetic ordering slip. This will facilitate any repairs or fabrication of future dentures for the patient.

CHAPTER 17

ANTERIOR DENTURE TEETH ARRANGEMENT

Instructions for Laboratory Procedures

LAB Session 6

For the purposes of this course however, we have assumed many "average" conditions governing the anatomical, demographic and preference aspects of our generic patient. Our project is to arrange the replacement (denture) teeth in orderly and proper fashion with due consideration for the esthetic and functional requirements of the dentures.

The anterior teeth we will be using are specifically TRUBYTE NEW HUE CLASSIC brand and are designated shade 62. Anterior denture teeth are packaged in complete sets of six, arranged in more-or-less anatomical fashion in soft wax on a flat plastic "card".

The maxillary set is designated as mold number 3N. This is a mold of average width and height and of a generally square-tapering shape. The various molds tend to be classified by manufactures in groups of graduated sizes (width and height) within the same overall shape category, (square, tapering, ovoid, square-tapering, tapering, ovoid).

We will use a mandibular set of six anterior teeth of the same manufacturer, DENTSPLY/TRUBYTE, same brand, NEW HUE CLASSIC, same shade, 62 and mold, 3N, recommended by the manufacturer as being compatible (corresponding) with the maxillary set of anterior teeth we have chosen.

A OCCLUSAL PLANE. Observe the occlusal plane of the wax occlusion rims on your patient's mounted Microstone master casts. The occlusal plane, in the sagittal view is parallel with Camper's plane (the ala-tragus line).

Viewing the frontal plane, the occlusal plane is parallel with the interpupillary line.

Remember that the level of the occlusal plane is as follows. The anterior level is approximately at the level of the lower border of the upper lip. The exact level may

be exactly at the border, one to several mm below it or above it - all depending on the position the patient's natural teeth occupied pre-extraction. This information should be available through pre-extraction casts and records. Old photographs are also reliable guides to the approximate position of the patient's natural teeth, as are the patient's memory or your observation of the mouths of the patient's siblings, children or parents. If none of these data are available, then you must rely on esthetic estimates based on evaluation of lip support as established by occlusion rims.

Recall that the posterior height of the occlusal plane is at a level approximately $\frac{2}{3}$ of the distance UP the retro-molar pad. It may be as high as the top of the retro-molar pad but not higher than that.

You should have previously drawn a horizontal pencil line on the base of the mandibular cast at a level $\frac{2}{3}$ up the retromolar pad. This will mark the posterior height of the occlusal plane as realized on the occlusion rims.

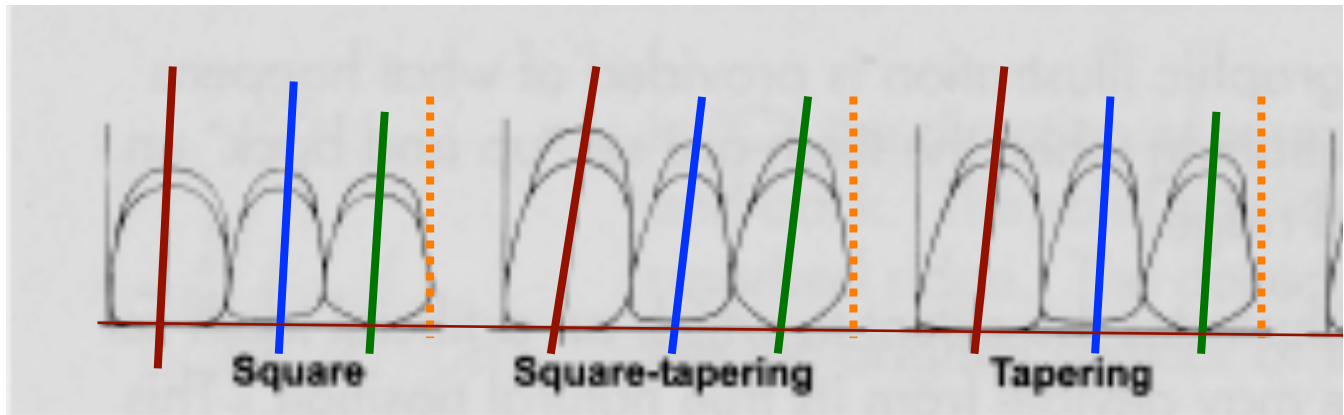
1. With a plaster knife, cut away a portion of the maxillary wax occlusion rim from the marked midlines toward the left for a distance of 10 mm.

This is somewhat wider than the left maxillary central incisor you will set in the space created. With the wide curved end of a no.7 wax spatula scrape away the wax rim in this cut section all the way to the Triad record base.

2. Take the maxillary left central incisor from the 1X6 card. With a 2X2 inch gauze pad wipe away any soft carding or mounting wax from the card that may still adhere to the tooth. Hold the tooth in position on the record base. (illustrations 15 and 16). Its incisal edge should be at exactly the occlusal level of the maxillary wax occlusion rim (remember you established this with the patient, making the wax rim contour provide proper lip support and displaying or not displaying the incisal 1mm of the labial surface of the tooth).

The tooth position is as follows:

- a. Midline relationship: the mesial surface of the central incisor is on the midline scribed on the maxillary occlusion rim. This midline should be the midline of the face. It may or may not coincide with the labial frenum.



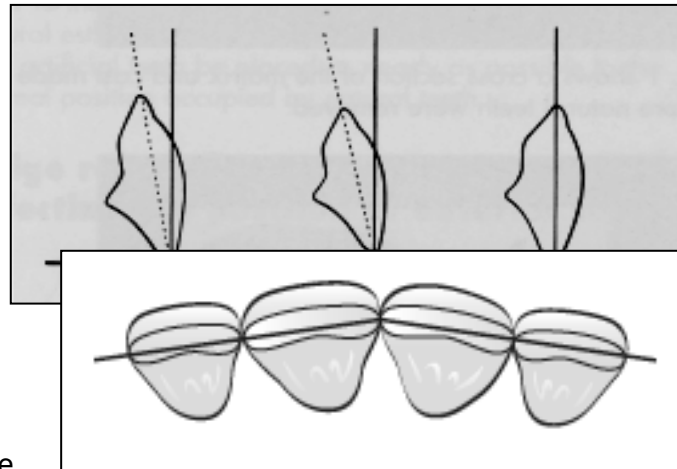
b. Palatal - labial inclination:
slightly flared toward the labial

c. Vertical position: incisal
edge at the occlusal plane
established by the wax
occlusion rim

d. Axial inclination: straight up-
and-down.

e. Rotation: Looking down at the

occlusal aspect of the occlusion rim, the labial surface of the tooth should be
congruent with the labial surface of the occlusion rim. It should fall exactly within
your established arch form.



f. Tooth modification: You may find that the tooth now is too thick labio-lingually
and will not fit the appropriate space for it in its proper relationship to the labial
contour of the wax occlusion rim. It may also be too long for the gingival - incisal
height of the arch as is fairly common when arranging denture teeth.

You may reduce the thickness of the record base in this area with an acrylic resin
trimming bur, being careful not to perforate the record base. You may also re-
contour (reduce) the ridge lap (that portion of the gingival surface of the denture
tooth that faces the alveolar process and interfaces with the record (denture) base.
It is entirely possible to make this reduction and allow the tooth more closely to
approximate the ridge without reducing the labial height of the tooth.

PRACTICE PEARL: Ridge laps of plastic denture teeth may be reduced as much as necessary to permit the incisal or occlusal surface to be positioned ON the occlusal plane. The guidelines to this recontouring are (1) not to shorten the tooth facially to the point where esthetic contour is compromised and (2) to leave enough axial bulk of the tooth to be embedded in the acrylic resin denture base material.

g. Now that you can properly position the maxillary left central incisor on the maxillary record base (now becoming the denture base), form a very shallow film of baseplate wax on the base with the very hot pointed end of the no.31 wax spatula or the wide end of the no.7 spatula. Position the tooth into the wax rim following the instruction described in page 91 -92. Make sure the molten wax contacts the dorsal surface of the tooth and fill any lingual space between the ridge lap and the denture base. Allow the hot wax to cool before continuing.

Much time has been allocated to describing the placement of just the first denture tooth on the record/denture base. This is quite appropriate because placement of that first tooth is so critical to the esthetics of the denture. An experienced dentist working with an experienced laboratory technician can rely on obtaining an esthetically pleasing arrangement of the entire anterior dental composition if just one maxillary incisor is accurately located and the maxillary and mandibular occlusion rims accurately depict the occlusal plane, occlusal vertical dimension and arch contour.

PRACTICE PEARL: The placement of the first central incisor is so crucial to the esthetics of the entire denture that it should be accomplished with the patient present. Then the denture base with the first maxillary central incisor in place can be tried in the mouth for a more realistic evaluation of midline, axial inclination and the esthetic relationship of the incisal edge to the lower border of the upper lip. Many experienced prosthodontists with a reputation for obtaining excellent esthetics invariably place §1112 anterior teeth on the denture bases with the patient seated in the operatory for successive tooth-by-tooth try-ins.

3. Set the adjacent contra-lateral right central incisor on the maxillary denture base. In almost every case, this tooth will be a mirror image of the first tooth placed. Together these two teeth anchor the anterior arch contour.

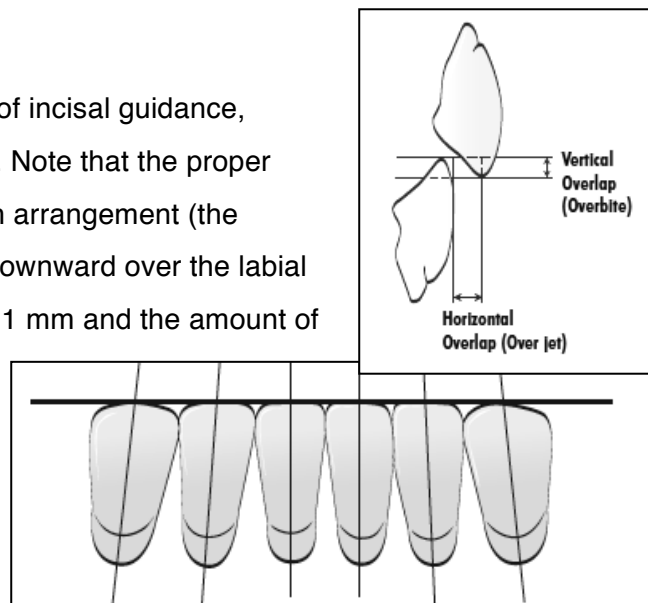
At this time remove the maxillary denture record base from the maxillary cast and look down on the tissue side. Recall the guideline that the distance from the center of the incisive papilla to the labial surface of the central incisors is 5 to 8 mm. does that distance on your setup of the two central incisors fall within these parameters? If not, re-position the two central incisors accordingly. Replace the record base on the maxillary Microstone cast.

4. Set the maxillary lateral incisors and canines in position. The maxillary lateral incisor is placed with the incisal edge about 0.5 mm above the occlusal plane and has a slight inclination toward the labial. The long axis of the tooth is inclined slightly toward the distal gingival.

The canines are set with the incisal tips either ON the occlusal plane, NEVER below the occlusal plane (the "fang" or Dracula look). The axial inclination is more markedly toward the mesial incisal. The neck of the canine is definitely made prominent by being out toward the labial and the incisal lip slightly inclined lingually.

5. The Mandibular Central Incisors:

Familiarize yourself with the concepts of incisal guidance, vertical overlap and horizontal overlap. Note that the proper amount of vertical overlap for this tooth arrangement (the amount the maxillary incisors extend downward over the labial surfaces of the mandibular incisors) is 1 mm and the amount of horizontal overlap (the labial-palatal distance or space between the lingual incisal edge of the maxillary anterior teeth and the labial surfaces of the mandibular teeth) is 1 to 2 mm.

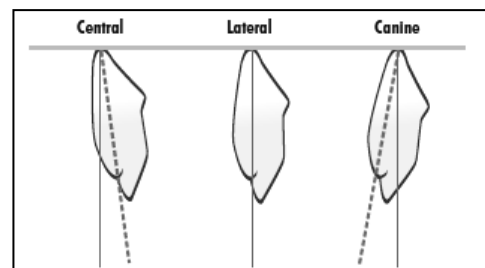


In this exercise, we will set all mandibular anterior teeth 1 mm above the established mandibular occlusal plane.

Position the left mandibular central incisor on the mandibular record base after removing the necessary segment of the mandibular wax occlusion rim. The mesial surface of the central incisor should be on the midline of the mandibular wax rim, directly below the mesial surface of the maxillary left central incisor.

You will probably need to re-contour the ridge lap of the mandibular incisor and probably reduce the thickness of the mandibular record base. The ridge lap of the mandibular contra! incisor should be directly opposite the crest of the mandibular alveolar ridge and the tooth should be vertical or, at most, very slightly inclined toward the, labial. Observe the requirements for vertical and horizontal overlap.

The arch form established by the labial surface of the occlusion rim is preserved: all labial surfaces of the maxillary anterior teeth lie just on the outer periphery of the occlusion rim.



6. Set the remaining mandibular anterior teeth. The right central incisor is a mirror image of the left. Allow for 1.0 mm of vertical over- lap and 1.0 to 2.0 mm of horizontal

overlap of the maxillary over the mandibular central incisors. Remember that all mandibular anterior teeth are 1.0 mm above the occlusion rim, thus automatically providing for vertical overlap.

The mandibular canines, like the maxillary canines, have their long axes inclined toward the mesial incisal and are inclined sufficiently toward the lingual to make the cervical third the most prominent portion of the labial surface.

Your tentatively completed anterior setup should look natural and esthetic, while fulfilling the various criteria for tooth placement:

1. Occlusal plane, 2. Vertical and horizontal overlap, 3. Relationship of the ridge laps to the ridges, 4. Axial inclination, 5. Labiolingual inclination, 6. Arch form.

POSTERIOR DENTURE TEETH ARRANGEMENT

Instructions for Laboratory Procedures

LAB Session 7, 8, 9

At this time it is important for you to familiarize yourself with the differing concepts of occlusion for complete dentures and the variety of types and classes of artificial posterior teeth developed and engineered to fulfill these concepts.

There are several broad classes of artificial posterior teeth used in removable partial and complete dentures. These classes of teeth are based on the geometry of the cusp angulation. The cusp angle is defined in "The Glossary of Prosthodontic Terms" as "the angle made by the average slope of a cusp with the cusp plane, measured mesio distally or buccolingually".

1. Anatomic Teeth

Posterior denture teeth with cusp angles of 20 degrees or greater are classified as anatomic, as they most nearly resemble natural teeth. Most of the currently available anatomical teeth have cusps in the 30 to 33 degree range of cuspal angulation.

2. Non-anatomical Teeth

Monoplane Teeth :Monoplane or zero degree teeth have flat (or monoplane) occlusal surfaces, thus zero-degree cuspal angles related to a horizontal surface.

3. Semi-anatomical Teeth

"Semi-anatomical" teeth are sometimes described as teeth with anatomic appearance but with reduced cuspal angles. A major manufacturer as "semianatomical" designates twenty-degree teeth although they are classified as anatomic by some authors. They find frequent use in removable partial denture construction, as their natural appearance resembles the well- worn natural teeth of middle aged and older patients.

The posterior teeth we will use in this exercise are anatomic, with 30 degree cusp angles, manufactured by the TRUBYTE Division of Dentsply International. The brand name is "BIOFORM IPN, P-T" (the designers of this series of posterior tooth molds were Drs. Pilkington and Turner). The teeth are designated "30 degree posteriors" and the color is 862 as found on the BIOFORM shade guide.

The size designated by this manufacturer in the upper left hand corner of a card of this set of eight maxillary posterior teeth is 230M. The "2" designates this particular series of 30 degree posterior molds, the "30" is the average millimeter distance from the mesial surface of the maxillary first premolar of one side to the distal surface of the second maxillary molar on the same side. The "M" designates an occluso-gingival height that is medium. This brand is also available in heights of short ("S") and long ("L").

The matching set of mandibular teeth has the same shade and size designation even though the mesiodistal dimension of the mandibular teeth of each side is 1.5 to 2mm greater than that of the maxillary teeth. They are nevertheless "matching" in that they are compatible when set up in the arches, as the mesiodistal dimension of the mandibular anterior teeth is less than that of the maxillary.

The foregoing three paragraphs present a complicated picture of size and mold designations as used by this manufacturer - probably more than you want to know. All these data indicate, however, that manufacturers of different brands of artificial teeth desire to convey in their own way as much useful information as possible in their catalogues and on their tooth cards - information that can be useful and sparing of time and guesswork to the clinician and laboratory technician.

ARRANGING (SETTING UP) THE POSTERIOR TEETH

OVERVIEW: Our main goal in setting up anatomical posterior teeth on complete dentures for an edentulous patient is to achieve prostheses that will be stable in the mouth (and therefore will enhance retention) while contributing to maximize the preservation of the residual alveolar ridges. At the same time, we seek to provide the patient with maximum masticatory function, comfort and natural esthetics. The last quality may indeed be the patient's main goal.

In order to provide maximum stability and function of the dentures, a major consideration is arranging the teeth in **balanced articulation**, which is "the bilateral, simultaneous, anterior and posterior occlusal contact of teeth in centric and eccentric positions", as defined in "The Glossary of Prosthodontic Terms". The concept of balanced occlusion is a static and dynamic one: it implies that the anterior and posterior teeth of dentures are in simultaneous and continual contact in maximum intercuspal position and throughout the patient's functional range of mandibular movement. An exception here is that the incisors of complete dentures are not in contact in maximum intercuspation - remember the introduction of horizontal incisor overlap to reduce the unstabilizing effect of leverage on the maxillary denture. The incisors do however come into contact as soon as the mandible starts moving into an eccentric position.

Adhering to the instructions that follow for positioning each tooth will enable you to achieve the goals of arranging the teeth on the denture bases in balanced occlusion and for maximum stability, function and natural esthetics.

1. Occlusal Plane:

Re-verify the occlusal plane at this point.

The anterior height of the occlusal plane is represented by the incisal edges of the maxillary anterior teeth. The posterior height is at a level $\frac{2}{3}$ of the height of the retromolar pad. This level should be marked on your cast by a horizontal line on the side of base of the cast.

The mandibular occlusion rim should be level and slightly inclined upward toward the posterior (Camper's plane); the anterior height is at the level of the incisal tip of the canine, the posterior at the $\frac{2}{3}$ mark of the retromolar pad.

2. Buccolingual Orientation of the Posterior Teeth.

The buccolingual location of the posterior teeth of the dentures is somewhat flexible - but not much. Conforming to the following procedures will aid in positioning the denture teeth.

a. remove the mandibular record base from the cast. Locate the buccolingual center of the retromolar pad on each side. Please see chapter 10.

Either by eye or with a ruler, imagine a mesiodistal line along the crest of the mandibular ridge, projecting distally through the center of the retromolar pad to the posterior land area and anterior to the anterior land area. With a pencil, mark those

lines on the anterior and posterior horizontal surfaces of the land. Re-seat the mandibular record base.

A straight line between the marks on the anterior and posterior land areas passes close to the incisal tip of the canine. With a ruler or the edge of your flat metal occlusal plane held between the anterior and posterior land area marks, score a pronounced longitudinal line on the occlusal surface of the mandibular wax occlusion rim on each side. The central fossae of the mandibular posterior teeth should be located more-or- less along this line. This therefore means that the palatal cusps of the maxillary posterior teeth should be directly above this line. If the mandibular teeth are located much more buccal to the ridge crest, the mandibular denture will be increasingly unstable.

The more lingual the point of application of masticatory force, the more stable the mandibular denture. (An ideally stable mandibular denture would have a single posterior tooth in the center of the lingual space, between and an equal distance from the right and left ridges). However, locating the central fossae of the mandibular posterior teeth much more lingual than the center line of the ridge would place the teeth where they would crowd the tongue. In other words: the lingual surfaces of the mandibular posterior teeth should be at least slightly BUCCAL to the lingual border of the mandibular denture base. In addition, the buccal surfaces of the maxillary teeth should not be as far buccally as the buccal border of the maxillary record base to prevent impingement on the mucosa of the cheek.

3. SETTING THE ARTICULATOR

In order to achieve balanced articulation (occlusion) with 30 degree posterior teeth, we shall make some clinical assumptions for our Resin Rock patient and arrange the articulator settings as follows:

- a. Condylar inclination: Set and lock the condylar angle inclinations at 30 degrees on both sides.
- b. Sagittal incisal guidance: looking at the articulator in the sagittal plane, set the sagittal incisal guidance at 20 degrees. This is in recognition of the vertical overlap of the maxillary central incisors over the mandibular incisors.

c. Lateral incisal guidance: Looking at the articulator in the frontal plane, adjust the two lateral wings of the incisal guide table to 20 degrees by using the adjusting screws under the globe of the incisal guide table. Set the locking nuts on these screws to hold these settings.

4. SETTING THE TEETH

a. Buccolingual relationship between the maxillary and mandibular posterior teeth (horizontal overlap).

Horizontal overlap (the buccolingual distance between the buccal cusps of the posterior maxillary and mandibular teeth) is a factor in the likelihood of a patient's inadvertent cheek-biting. If there is little or no horizontal overlap, cheek-biting is more probable, so you should make an effort to incorporate horizontal overlap in the buccolingual positions of the posterior maxillary and mandibular teeth respectively.

b. There have been many methods proposed and used in setting posterior teeth on denture bases. These methods differ mainly in the sequence of placing the teeth. Some of the variations proposed are:

- (1) Setting all the mandibular posterior teeth first, then the maxillary
- (2) Setting all the Maxillary teeth, then the mandibular
- (3) setting the mandibular first molar first, as its position related to the ridge buccolingually and/or its relation to the occlusal plane are guides to the positions of all the remaining posterior teeth.

All these approaches have their advocates, who are equally successful in achieving good balanced occlusion in complete dentures. Indeed, no matter which sequence is used in setting the teeth, the resulting dentures with balanced occlusion should be quite similar if not identical. In our lab exercise, we shall begin our posterior tooth arrangement with the maxillary left first premolar, then set the opposing mandibular left first premolar; we shall set each succeeding left posterior maxillary tooth and its mandibular antagonist until that side is completed, then repeat the process on the right.

IMPORTANT NOTE: When setting each maxillary posterior tooth, align the palatal

cusps with the antero-posterior reference line you have scored on the occlusal surface of the mandibular occlusion rim. This line marks the crest of the mandibular residual alveolar ridge.

c. With a plaster knife remove from the left side of the maxillary occlusion rim a segment of wax slightly larger than the first premolar. Remove the wax all the way to the surface of the record base.

Set the maxillary left first premolar in position. The palatal cusp is ON the occlusal plane and the buccal cusp is raised 0.5 mm, giving the tooth a slight inclination toward the buccal when viewed in the frontal plane. In viewing of the sagittal plane, the long axis of the tooth is vertical (perpendicular to the occlusal plane). Flow enough hot baseplate wax around the neck of the tooth buccally and lingually to hold the tooth in position. Use the spear-shaped end of the No.31 spatula.

d. Remove from the left side of the mandibular occlusion rim a segment of wax down to the Triad base slightly larger than the mandibular first premolar. Place that tooth in position with the buccal cusp in occlusal contact with the mesial marginal ridge of the maxillary first premolar. If there is insufficient space distal to the mandibular canine to permit placement of the first premolar in the proper occlusal relationship, you may either reduce the mesial surface of the mandibular first premolar or move the maxillary first premolar distally by up to 1.0 mm or BOTH.

e. Set the maxillary second premolar in position on the maxillary record base. The relationship of the buccal and palatal cusps to the occlusal plane is identical with that of the first maxillary premolar, as are the long axis and the buccal inclination.

f. Set the mandibular second premolar. The buccal cusp should articulate with the mesial marginal ridge of the maxillary second premolar AND the distal marginal ridge of the maxillary first premolar.

g. Set the maxillary first molar. The antero-posterior compensating curve (curve of Spee) in the sagittal plane and the mediolateral compensating curve (curve of Wilson) in the frontal plane both begin here. Set the tooth as follows:

- (1) the mesiopalatal cusp is ON the occlusal plane
- (2) the distopalatal cusp is 0.5 mm above the occlusal plane
- (3) the mesiobuccal cusp is 0.5 mm above the occlusal plane
- (4) the distobuccal cusp is 1.0 mm above the occlusal plane. Observance of these four cusp-level criteria will give the tooth a buccal inclination slightly greater than that of the premolars and an occluso-lingual axial inclination slightly toward the mesial.

(5) Curvature of the arch. When setting the maxillary first molar, the tooth should be slightly rotated buccolingually around its occluso-lingual axis so that the buccal surface of the distobuccal cusp is slightly MEDIAL to that of the mesiobuccal cusp. This will impart a more natural curvature to the arch form. NOTE that a straight edge placed at the FACIAL prominence of the maxillary teeth from canine posteriorly will show the canine, both premolars and the mesiobuccal cusp of the maxillary first molar to be on the same sagittal plane.

h. Set the mandibular first molar.

- (1) the mesiobuccal cusp tip articulates with two maxillary teeth: the distal marginal ridge of the maxillary second premolar and the mesial marginal ridge of the first molar.
- (2) the buccal cusp articulates with the central occlusal fossa of the maxillary first molar.
- (3) the mesiopalatal cusp of the maxillary first molar articulates with the central fossa of the mandibular first molar.
- (4) the distopalatal cusp of the MAXILLARY first molar articulates with the distal marginal ridge of the mandibular first molar.
- (5) note that when placed in the proper position in maximum intercuspation, the mandibular first molar will be slightly inclined toward the lingual and its gingivo-occlusal long axis viewed in the sagittal plane will be slightly inclined toward the mesial. The occlusal surface will also conform to the antero-posterior

compensating curve (of Spee) and the mediolateral compensating curve (of Wilson).

i. Maxillary second molar

- (1) the mesiopalatal cusp is 1.0mm above the occlusal plane
- (2) the distopalatal cusp is 1.5mm above the occlusal plane.
- (3) the mesiobuccal cusp is 1.5mm above the occlusal plane
- (4) the distobuccal cusp is 2.0mm above the occlusal plane

j. Mandibular second molar

- (1) mesiobuccal cusp of the mandibular second molar articulates with the distal marginal ridge of the maxillary first, molar and the mesial marginal ridge, of the maxillary second molar.
- (2) the distobuccal cusp of the mandibular second molar articulates with the central occlusal fossa of the maxillary second molar.
- (3) the mesiopalatal cusp of the maxillary second molar articulates with the central occlusal fossa of the mandibular second molar.
- (4) the distopalatal cusp of the maxillary second molar articulates with the distal marginal ridge of the mandibular second molar.

k. The arrangement of the posterior teeth of the left side is now TENTATIVELY complete, pending arrangement of the right side and developing balanced articulation.

l. Set the maxillary posterior teeth of the right side in the same sequence as you set the left side.

m. When the arrangement of posterior teeth on both sides is complete, flow sufficient baseplate wax around and under each tooth to hold it in position. (use the spear-shaped end of the No.31 spatula for this purpose).

PRACTICE PEARL: You may very well encounter a situation where a posterior tooth (usually a maxillary and mandibular pair) must be omitted from a setup. This may occur when there is just insufficient mesiodistal space for an entire quadrant of four posterior teeth or where the ridge morphology is such that the second mandibular molar would have to be placed on a steeply inclined mandibular ramus. To do so would be to concentrate occlusal forces on an inclined ridge plane and thus sharply decrease the stability of the mandibular denture. Omitting a posterior tooth (either a premolar or a second molar) is highly advisable in such cases. If a mandibular tooth is omitted from the articulation, its maxillary antagonist on the same side is usually also left out.

n. **TOOTH POSITION CHECK:** At this time, use of your 20 degree metal occlusal template will give you useful information on the adequacy of your denture setup. The 20 degree occlusal template is a horseshoe-shaped, curved metal plate that looks as though it were cut out of the surface of a large metal sphere. Note that it is curved both across the horseshoe and from front to back of the horseshoe. Hold the concave side of the curved occlusal plate against the incisal and occlusal surfaces of the maxillary teeth, with the closed end of the curved occlusal plate under the anterior teeth. If all the teeth have been placed in their optimum position relative to the occlusal plane and compensating curves, ALL incisal edges and, especially, all cusp tips of the posterior teeth will be in contact with the upper concave surface of the metal plane. The bottom or convex side of the metal template held against the incisal and occlusal surfaces of the mandibular teeth should contact all cusp tips. Discrepancies of tooth position, if major, should be corrected now.

5. BALANCING ARTICULATION OF ANATOMIC TEETH IN EXCURSIVE MOVEMENTS

The articulation you have just set up has been arranged in the position of maximum intercuspation. Thus the lingual (palatal) cusp tips of all the maxillary posteriors articulate with marginal ridges and central fossae of the mandibular posterior teeth. Before starting to set the teeth you set the condylar-path

inclinations at-30-degrees- and the inclination of the incisal guide table at 20 degrees. Ideally, if you have arranged the teeth, each cusp in its prescribed relation to the occlusal plane, you will have achieved the antero-posterior and mediolateral compensating curves and consequently the articulation should be balanced or close to being balanced. We will achieve balanced articulation by either making minor adjustments of tooth position or by selective grinding of the occlusal surfaces or both (probably both). Balanced articulation is defined by "The Glossary of Prosthodontic Terms" as "the bilateral, simultaneous anterior and posterior occlusal contact of teeth in centric and eccentric positions".

a. Right Lateral Movement

- (1) open the centric relation locks of the articulator
- (2) move the upper member of the articulator to the left. This is actually the same as moving the mandibular member to the right. The right side is now termed the working side and the left side is the balancing side.
- (3) **WORKING RELATIONS:** In the right lateral movement, the **BUCCAL** cusps of the mandibular right posterior teeth (the working side) slide down the palatal inclines of the maxillary right **BUCCAL** cusps, remaining in contact with them, while the lingual cusps of the mandibular right posteriors slide down between the **LINGUAL** (palatal) inclines of the palatal cusps of the maxillary right posteriors, **ALL THE WHILE REMAINING IN CONTACT**. At the same time the anterior teeth, maxillary and mandibular, come into contact with each other and in harmony with the **WORKING** side contacts.
- (4) **BALANCING RELATIONS:** On **RIGHT LATERAL MOVEMENT**, the lingual inclines of the buccal cusps of the mandibular **LEFT** posterior teeth (**BALANCING SIDE**) slide on the buccal inclines of the palatal cusps of the left maxillary posterior teeth, remaining in contact with them.
- (5) Correcting for occlusal prematurities in right lateral movement. Correction of occlusal discrepancies in excursive movements requires judgment. A very large (greater than 1mm) occlusal prematurity (hyperocclusion) or an occlusal deficiency (infra-occlusion) is probably best corrected by actually moving the offending tooth or its antagonist, usually to correct its angulation relative to the compensating

curves and/or plane of occlusion. Make such corrections by heating the narrow end of the No.7 spatula and penetrating the baseplate wax around the tooth in several locations in the buccal and lingual gingival area.

This will soften the wax enough to allow moving the tooth slightly, using the No. 7 spatulas a lever under the ridge lap of the tooth to change its orientation to the plane of occlusion or compensating curves. Small occlusal prematurities in lateral movements are more easily corrected by selective grinding. The object of selective grinding is to eliminate excursive occlusal prematurities WITHOUT reducing centric occlusion contacts that maintain occlusal vertical dimension.

- a. use THIN articulating film interposed between the maxillary and mandibular teeth of both the right (working) and left (balancing) side when making the mandibular movement TO THE RIGHT.
- b. to reduce a WORKING SIDE (RIGHT) prematurity in right lateral excursion, grind the buccal cusp of the upper right or the lingual cusp of the lower right tooth. (Buccal of the Upper, Lingual of the Lower=BULL).
- c. to reduce a BALANCING (left) side prematurity in right lateral excursion, grind the LINGUAL cusp of the upper left posterior tooth or the BUCCAL cusp of the lower left posterior tooth (LUBL).
- d. LEFT LATERAL MOVEMENT. In left lateral movement , the left side is the working side and the right side is the balancing side. The same rules apply in correcting occlusal discrepancies in excursive movements. Some corrections, especially those for prematurities greater than 1.0 mm or where the discrepancies are those of occlusal deficiency (infra- occlusion), should be made by bodily changing the angulation of a tooth and/or its antagonist.

Smaller eccentric prematurities are corrected by selectively grinding the buccal cusps of the maxillary teeth and the lingual cusps of the mandibular ON THE WORKING SIDE (BULL) and on the balancing side, grinding the lingual of the upper and buccal of the lower (LUBL).

PRACTICE PEARL: On some occasions where there is infra-occlusion in working or balancing side lateral excursion, you may bodily and without changing its angulation raise slightly a mandibular tooth{or lower a maxillary one) to a position

that increases the occlusal vertical dimension temporarily. Then grind the opposing fossa or marginal ridge. This will then correct the temporary hyperocclusion and correct the infra- occlusion in the eccentric position.

e. Protrusive excursion: In straight protrusive excursion, the lingual slope of the incisal edges of the maxillary central incisors come into contact with the labial slope of the incisal edges of the mandibular central and lateral incisors. (The maxillary lateral incisors may or may not come into contact with the mandibular lateral incisor and the mesial slope of the mandibular canines, depending on how much vertical overlap there is between the maxillary and mandibular central incisors). Ideally, all of the maxillary cusps from the canine on back, remain in simultaneous and continual contact with their mandibular occlusal antagonists, along with incisal edges of the maxillary and mandibular central incisors. Occlusal prematurities in protrusive excursion should be corrected mainly by reducing the distal slopes of the cusps of the maxillary teeth or the mesial slopes of the cusps of the mandibular. If the cusp TIPS are in heavy premature occlusion in protrusive movement, you must judge carefully whether to grind (and which) a cusp tip OR move the tooth slightly to change the buccal or lingual inclination.

Keep in mind the importance of retaining the tooth-to-tooth contacts that maintain occlusal vertical dimension in maximum intercuspation. In all your work achieving a balanced occlusion, while it is often helpful to move teeth around in the approach to balanced articulation, most of the occlusal corrections that are required entail selective grinding of the teeth AFTER arranging them first in the best possible maximum intercuspation articulation.

CHAPTER 19

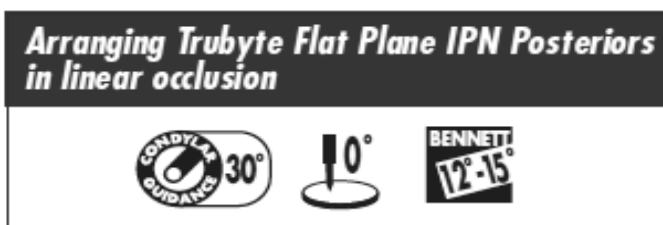
ARRANGEMENT OF Zero degree posterior teeth

Zero degree denture teeth are used very frequently in the predoctoral clinic. Non-anatomical, Non-anatomical, with the illusion of well-worn anatomical teeth. Zero degree cusps are noninterfering and provide complete freedom in lateral excursions. Ideal for Advanced ridge resorption. Balanced occlusion or Neutrocentric occlusion can be achieved.

Design features

- Trubyte® Portrait® IPN® 0° Posterior teeth are suitable for complete dentures where a zero degree tooth is indicated or preferred.
- A wider bucco-lingual table promotes efficient function and ease of set-up.
- Zero degree cusp areas are non-interfering and provide complete freedom in lateral excursions.
- When viewed in the mouth, the mesiofacial appearance of 0° teeth resemble well-worn natural teeth.
- A modified rational occlusal design gives the illusion of anatomical teeth. Portrait IPN 0° teeth may be arranged for continuous bilateral balanced occlusion with the proper compensating curve or in flat linear occlusion.
- Open occlusal angles are ideal for lingualized set-up with semi or fully anatomical upper posteriors, especially “even-dimensional” 10° and 33° posteriors.
- To aid in arrangement, the maxillary teeth may be positioned with the lingual surfaces set to a straight edge. This positioning automatically provides a proper degree of buccal contour for good esthetic appearance and function.

Articulator setup recommendations



Arrangement Recommendations

1. Place the maxillary premolars and molars with their long axes at right angles to the occlusal plane (Fig. 1). The buccal and lingual cusp areas should touch the plane (Figs. 1 and 2).



Figure 1

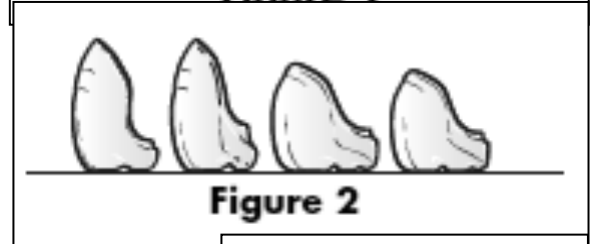


Figure 2

2. A straight edge may be used to align the lingual cusps of all four posteriors to a straight line (Figs. 3 and 4).

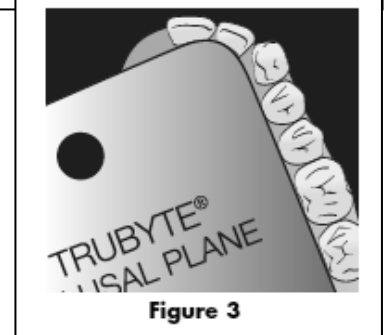


Figure 3

3. Follow the same procedure in placing the posteriors on the opposite side.

4. Then occlude the mandibular teeth to the maxillary teeth (Figs. 6-12). There should be approximately 1.5 mm of buccal overjet by the maxillary teeth as shown in Fig. 5.

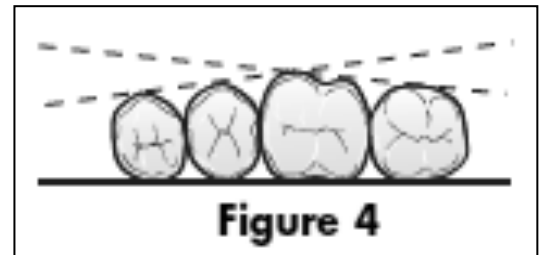


Figure 4

This buccal overjet is essential to prevent “cheek biting”.

The arrangement illustrated here was done with a 30° condylar inclination and a 0° incisal inclination. Other guidance factors may be used as individual conditions indicate. In this type occlusion with 0° Posteriors, there will normally be no contact in balancing positions.

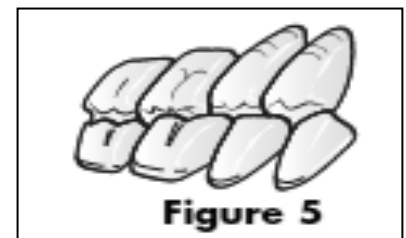


Figure 5

Relation of the maxillary and mandibular first molar

Note: The maxillary and mandibular teeth do not interdigitate. They may be set end-to-end as shown in Fig. 6. It is possible to position premolars to oppose molars because there is no interdigitation of the cusps.

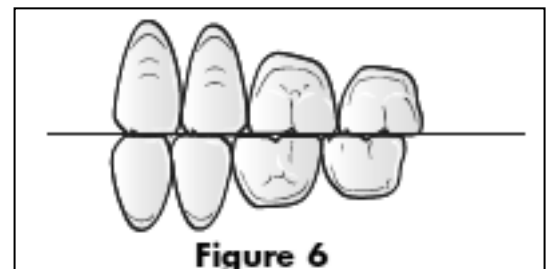


Figure 6

0°Posteriors - The Completed Tooth Neurocentric Arrangement

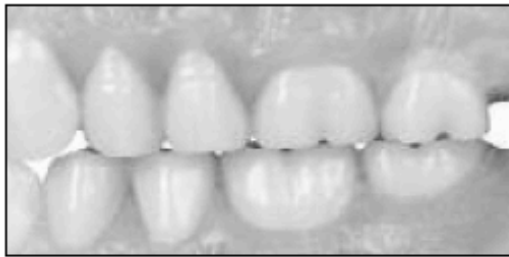


Figure 7. Portrait® IPN® 0° flat linear type tooth arrangement in centric occlusion, buccal view.

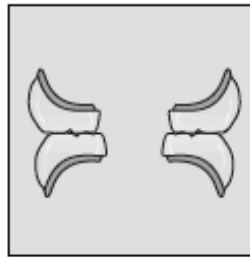


Figure 8. Cross section of centric occlusion.

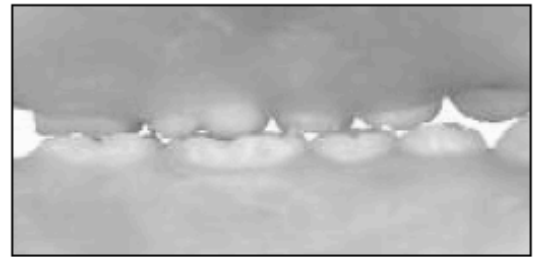


Figure 9. Centric occlusion, lingual view.



Figure 10. Working occlusion, buccal view.

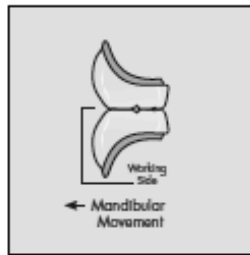


Figure 11. Cross section of working occlusion.

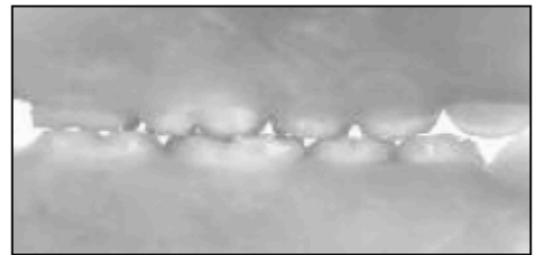


Figure 12. Working occlusion, lingual view.

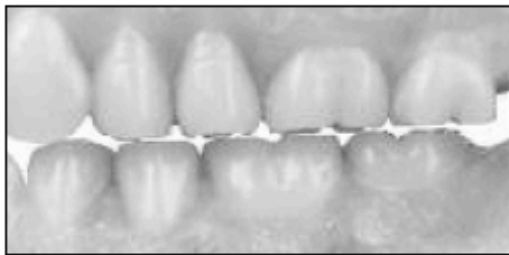


Figure 13. Balancing position, buccal view.

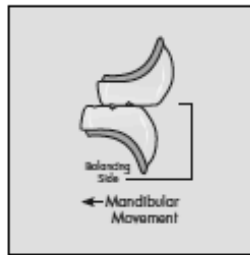


Figure 14. Cross section of balancing occlusion.

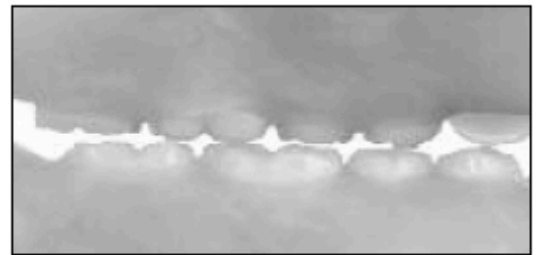


Figure 15. Balancing position, lingual view.

CHAPTER 20

Arrangement of 20 degree posterior teeth

NOTE: The technique described in this chapter applies **ONLY** to Pre-Doc Clinical patients!

20 degree denture teeth are used very frequently in the predocoral clinic. Semi-anatomical, shallow 20° cusps offer minimal interference and interacting ridges with clearance spaces to enhance chewing efficiency. Ideal for Semi-resorbed ridge. Balanced occlusion can be achieved.

Design features

Trubyte 20° Posteriors are designed to overcome certain problems of the edentulous patient by utilizing shallow cusp angles as an aid in reducing lateral thrust forces. Because the occlusal surfaces have interacting ridges and intercommunicating clearance spaces, masticating efficiency is greatly enhanced. Trubyte 20° Posteriors will be found

desirable for use whenever a semi-anatomical cuspal design is preferred or indicated. DESIGNED to function in accordance with anatomical requirements of mandibular movements.

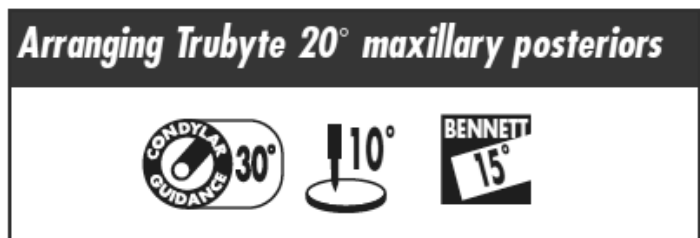
ENGINEERED for increased masticating efficiency with shallow cusp inclinations, interacting ridges and intercommunicating clearance ways.

A CORRECT AXIS for each tooth to direct masticating forces and to assist in stability and retention of the denture.

SELF-CLEANSING SULCI to help prevent food packing on chewing surfaces and to maintain a high degree of masticating efficiency.

READILY ADAPTABLE to both steep and shallow condyle paths without destructive change in the occlusal surface.

Articulator setup recommendations



Arrangement Recommendations

The following is the instruction of the arrangement of the 20 degree teeth.

1. Place the maxillary first premolar with its long axis at right angles to the occlusal plane. The buccal and lingual cusps are placed on the plane.

2. Place the maxillary second premolar in a similar manner.

3. The mesiobuccal and mesiolingual cusps of the upper first molar touch the occlusal plane. The distobuccalcusp is raised about 1/2 mm and the distolingual cusp will be raised accordingly.

4. All the cusps of the second molar are raised from the lower occlusal plane following the same angle or

plane of the first molar. The mesiobuccal cusp should be about 1 mm from the occlusal plane.

5. A straight edge may be used to align the labial ridge of the canine, the buccal ridges of the first and second premolars, and the mesiobuccal ridge of the first molar.

The buccal ridges of the molars are similarly aligned, but angled slightly inward .

6. Follow the same procedure in placing the posteriors on the opposite side.

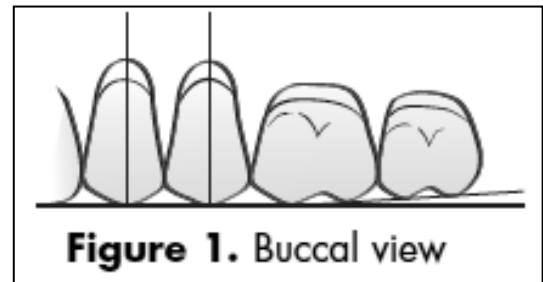


Figure 1. Buccal view



Figure 2. Interproximal view

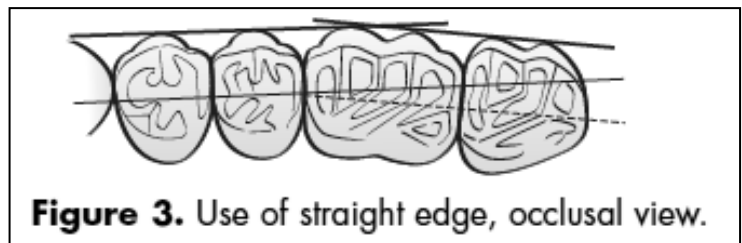
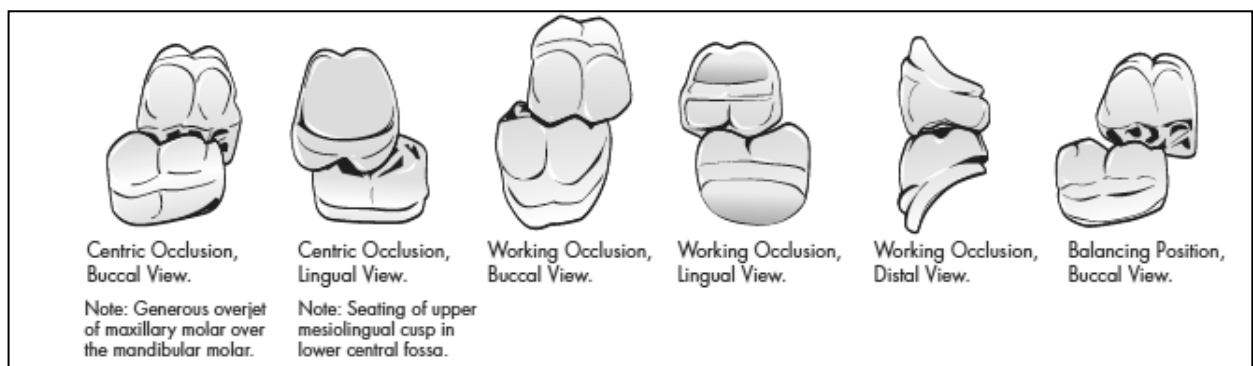


Figure 3. Use of straight edge, occlusal view.

Relation of the maxillary and mandibular first molar

First molars are the keystone to posterior occlusion. Illustrated here are ideal relationships.



Articulation of mandibular first molar

Bilateral balanced occlusion contributes greatly to the comfort and efficiency of complete dentures. Without balanced occlusion there may be greater resorption, less mastication efficiency, and a recurrence of sore spots. This can be accomplished with a minimum of effort if each tooth is brought into function. If careful attention is paid to the positioning of the mandibular first molar, articulation of the remaining posteriors will be greatly facilitated.

20° Posteriors - The Completed Tooth Arrangement in all Relations

The remaining teeth are inter-digitated in a similar manner. Check the centric and lateral relationships of each tooth as it is positioned - as well as the completed tooth arrangement in all relations.

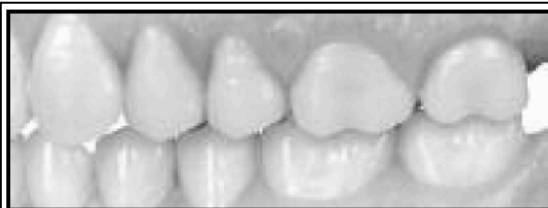


Figure 4. In centric occlusion, buccal view

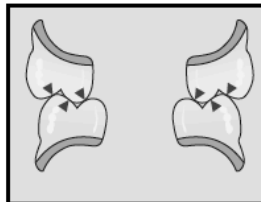


Figure 5. Cross section of centric occlusion.

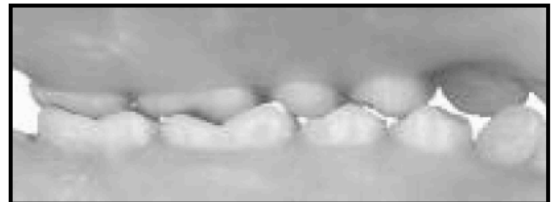


Figure 6. In centric occlusion, lingual view



Figure 7. In working occlusion, buccal view

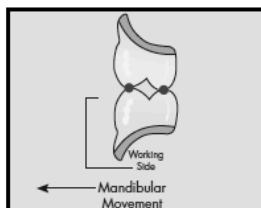


Figure 8. Cross section of working occlusion.

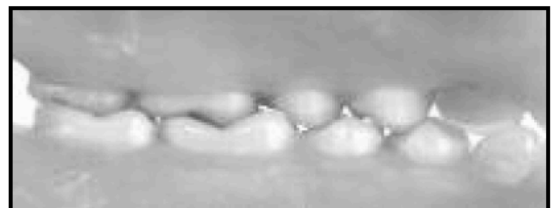


Figure 9. In working occlusion, lingual view



Figure 10. In balancing relation, buccal view

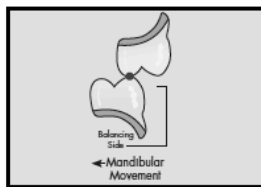


Figure 11. Cross section of balancing occlusion.

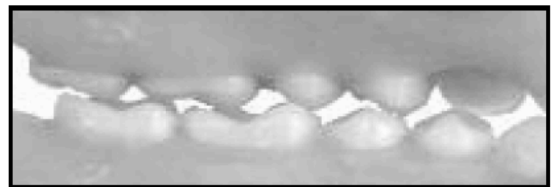


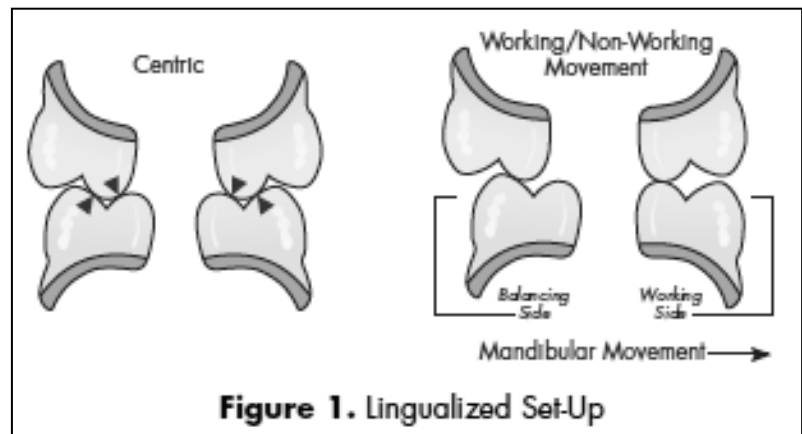
Figure 12. In balancing relation, lingual view

CHAPTER 21

Lingualized occlusal scheme denture teeth arrangement

INTRODUCTION

Description: A posterior arrangement method that eliminates tooth contact points on the buccal cusps to assure seating and minimize tipping of the lower denture upon contact.



Lingualized occlusion* was

first documented in dental literature in 1927 by one of the founding-fathers of denture teeth articulation, Dr. Alfred Gysi, of Switzerland. It is defined as, “setting the upper posterior teeth in a turned-out position (cusps toward the cheeks), so that only the lingual cusps of the maxillary teeth contact the center of the occlusal table (the fossa) of the mandibular posterior teeth”

The focus of this posterior arrangement method is on elimination of the tooth contact points on the buccal cusps. Thus, the occlusal contacts are moved as far lingually as practical, while still maintaining the physiologic positioning of the prosthetic teeth. Preservation of the lingual contacts assures seating and minimizes tipping of the lower denture upon tooth contact and during function.

Within practical limits, it is esthetically optimal when denture teeth are arranged close, to where the natural teeth were originally located, prior to ridge resorption. Radiographs and pre-edentulous photographs of the patient are important in determining this position. However, patients with resorbed ridges and restricted neutral zones (the channel where the teeth are located that should not be affected by tongue, lip and cheek forces which could unseat the denture) may determine the extent to which esthetics will be sacrificed for functional improvements. In such cases, lingualized occlusion minimizes esthetic compromises and optimizes functionality.

The technique of setting up lingualized articulation

For a lingualized occlusion, select a higher degree cusp angle on the upper posterior teeth than the degree of cusp angle of the lower posterior teeth. We recommend that the maxillary posterior teeth be a 30° cuspal angulation or greater and that the mandibular posterior

However when proper lingualized articulation techniques are used almost any combination of teeth will function properly.

The following is Trubyte's suggested process for lingualized articulation and arrangement of posterior teeth to achieve function, comfort, and esthetics for a fully edentulous patient.

1. Set the **upper arch first** with ideal Curve of Spee, Curve of Wilson, and Lingual Curve except when a linear arrangement is desired.

NOTE: Set the anterior denture teeth in their physiologic position for esthetic and phonetic reasons. Posterior teeth can be set over the resorbed ridge when adequate tongue space exists, or facial to the ridge when esthetics require facial placement of the teeth (Figure 2).

2. If a lingualized arrangement is desired, when all maxillary teeth have been set insert an object the approximate thickness of a 2mm ruler between the buccal cusps of the posterior teeth and the table while the set-up wax is still soft (Figure 3). Apply pressure. This technique will elevate the maxillary

buccal cusps to the right position for proper contact between the opposing stamp cusps. This also eliminates any contact between the maxillary buccal cusp and the opposing mandibular buccal cusp in the working movement.

3. Begin setting the **mandibular arch with the first molars**. The mandibular first molars are the "key to occlusion" (Figures 4, 5). Use the mesiolingual

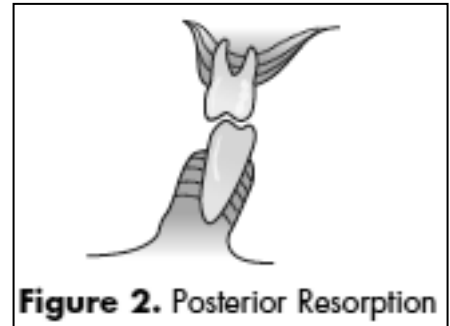


Figure 2. Posterior Resorption

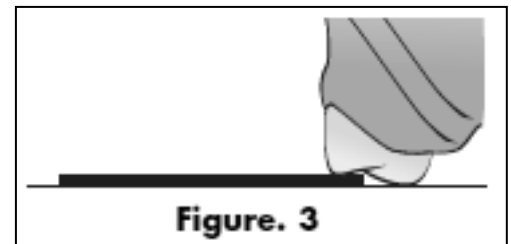


Figure. 3



Figure 4. Mandibular first molar - Buccal View

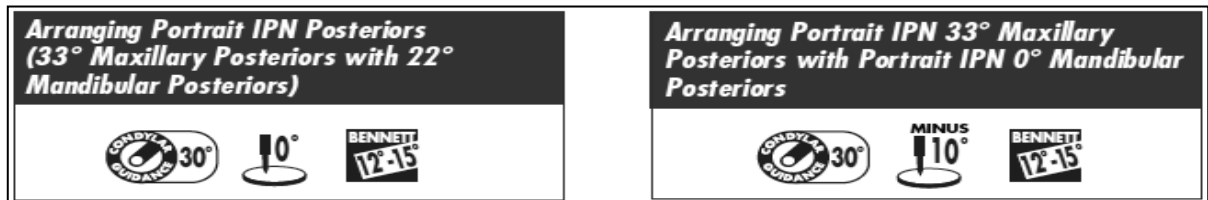


Figure 5. Mandibular first molar - Lingual View

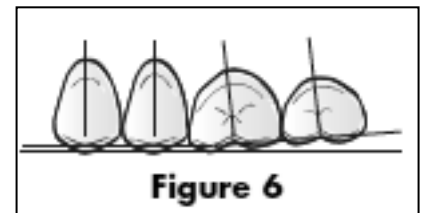
maxillary cusp as the stamp cusp. A stamp cusp is a working cusp, which occludes into a fossa in the opposing dentition. In lingualized occlusion the maxillary stamp cusps are preserved. No grinding should occur on these teeth. Use the rule of BULL for adjustments: if needed, occlusal grinding should eliminate contact on the Buccal cusps of the Upper teeth and remove premature contact from Lingual cusps of the Lower teeth. Set the remaining mandibular posterior teeth.

4. Grind-in option: You also have the option to grind in occlusion. Prior to setting the mandibular teeth, open the articulator pin 1mm. Grind a saucer shape approximately 2mm wide to accommodate the stamp cusps. The saucer shape is developed by marking both

centric and eccentric occlusion with articulating paper. Continue to develop the saucers until the pin contacts the incisal guide table.

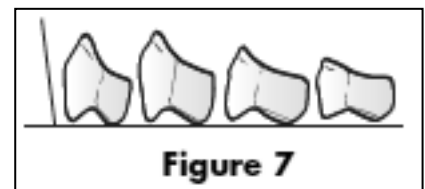


1. Place the 33° maxillary premolars with their long axes at right angles to the occlusal plane (Fig. 6). The lingual cusps should touch the plane and the buccal cusps should be raised approximately 1/2 mm above the plane (Figs. 6 and 7). A straight edge may be used to align the lingual cusps as shown previously.

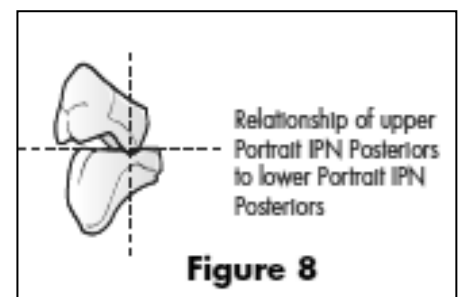


2. The first and second molars may be set with their long axes inclined slightly mesially (Fig. 6).

3. The mesiolingual cusp of the first molar touches the plane, and the mesiobuccal cusp is approximately 1/2 mm above the plane. The distolingual cusp is slightly above the plane, and the distobuccal cusp is approximately 1 mm above (Figs. 6 and 7).



4. The second molar is set to follow the same angle or plane of the first molar. The distolingual cusp is approximately 1-1/2 mm above the plane, and the distobuccal cusp is approximately 2 mm above the plane



(Figs. 6 and 7).

5. Follow the same procedure in placing the posterior teeth on the opposite side.

6. Occlude the central fossae area of the mandibular 0° or 22° teeth to the lingual cusps of the maxillary 33° teeth. A typical relationship of upper to lower is illustrated in Fig. 8.

Portrait® IPN® Teeth - 33°/ 22° Example for Lingualized Occlusion



Figure 9. Portrait® IPN® Lingualized balanced arrangement in centric occlusion, buccal view.



Figure 10. Cross section of centric occlusion.

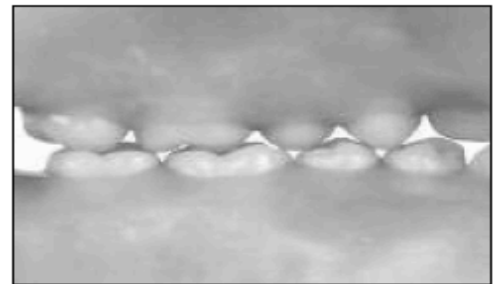


Figure 11. Centric occlusion, lingual view.

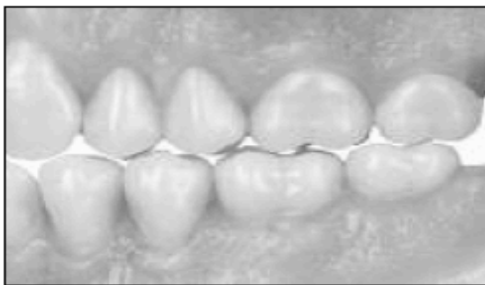


Figure 12. Working occlusion, buccal view.

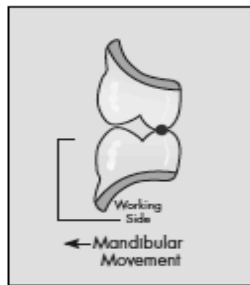


Figure 13. Cross section of working occlusion.

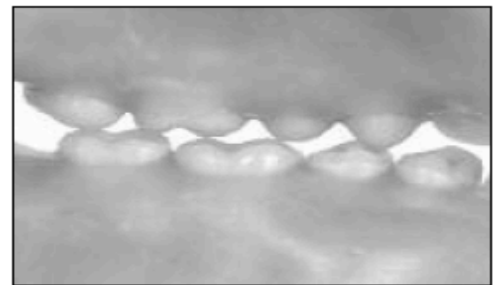


Figure 14. Working occlusion, lingual view.



Figure 15. Balancing occlusion, buccal view.

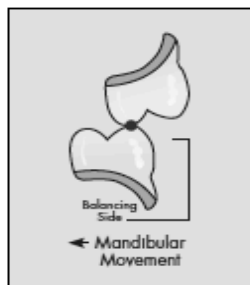


Figure 16. Cross section of balancing occlusion.

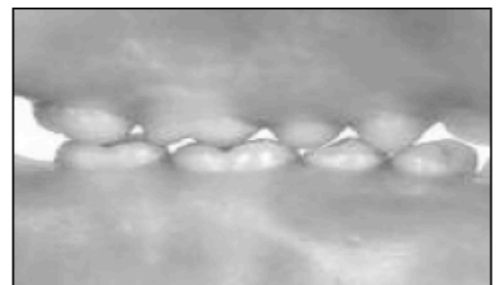


Figure 17. Balancing occlusion, lingual view.

Portrait® IPN® Teeth - 33°/ 0° Example for Lingualized Occlusion



Figure 18. Centric occlusion, buccal view.



Figure 19. Cross section of centric occlusion.

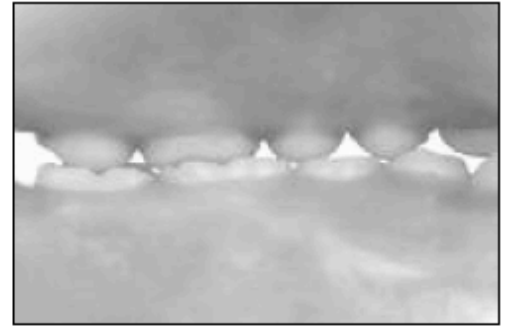


Figure 20. Centric occlusion, lingual view.



Figure 21. Working occlusion, buccal view.

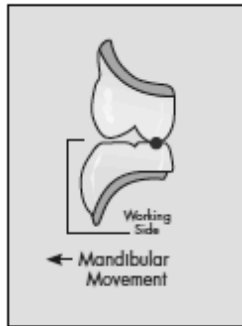


Figure 22. Cross section of working occlusion.

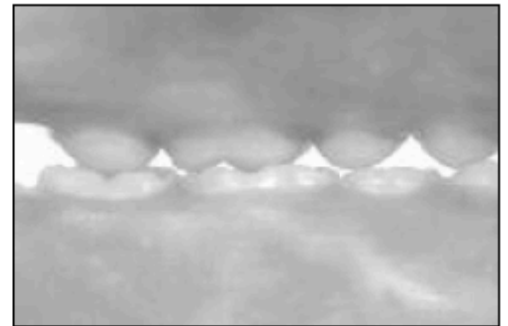


Figure 23. Working occlusion, lingual view.



Figure 24. Balancing occlusion, buccal view.

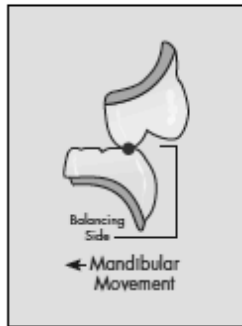


Figure 25. Cross section of balancing occlusion.

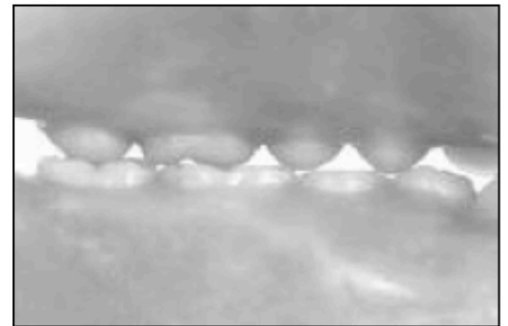


Figure 26. Balancing occlusion, lingual view.

CHAPTER 22

CLINICAL VISIT #4

DENTURE TEETH ARRANGEMENT TRY-IN VISIT

THERE ARE MORE THAN ONE WAY TO SCHEDULE DENTURE TEETH ARRANGEMENT TRY-IN APPOINTMENT(S).

1. The anterior teeth and posterior teeth can be arranged based on the wax rims, jaw relation records and other data collected from previous visits. The arrangement can be tried in in visit # 4.
2. Or after the anterior teeth arrangement has been completed and the anterior arrangement could be tried in the 4th visit. In the 4th visit, the vertical dimension and centric relation record are preliminarily verified. The definitive denture teeth try-in is in the 5th clinical visit.

The clinical protocol of NSU CDM for the denture teeth arrangement try-in visit is a one-step process. But if the clinical situation requires, a 2nd try-in visit can be scheduled in order to achieve the optimal result. Our discussion in this chapter will be following the 1-visit protocol.

CLINICAL VISIT #4 DENTURE WAX TRY-IN VISIT

- A. Reconfirm vertical dimension and centric relation
- B. Reconfirm the mold, shade, and arrangement of the artificial teeth
- C. Program the articulator with lateral and protrusive records (for anatomic teeth)
- D. Reconfirm the posterior extension (post palatal seal)
- E. Patient approval

OBJECTIVES

- a. To verify the jaw relation records and to program the articulator
- b. To evaluate the harmonious composition of the artificial teeth
- c. To obtain the patient's acceptance of the trial dentures

d. To complete the Checklist for Wax Trial Insertion Appointment

CLINICAL PROCEDURES

Have the mounted trial dentures evaluated by faculty prior to the patient's appointment. You are then required to disinfect the prostheses in an approved disinfectant and thoroughly rinse the try-in dentures under running water.

CONFIRM THE VERTICAL AND CENTRIC RELATIONS

1. Check the centric relation and vertical dimension of occlusion first. A faulty centric relation record causes an incorrect mounting and creates the need to (1) make a new record, (2) remount the mandibular cast (while maintaining the existing, confirmed vertical dimension) and (3) rearrange the mandibular posterior teeth. This is time consuming, so check centric relation FIRST.
2. Insert the wax trial dentures in the patient's mouth. Instruct the patient not to hold the teeth firmly together during the try-in phase as this may dislodge the teeth from the wax and alter the arrangement.
3. Holding the lower record base in place, guide the patient slowly into centric relation. Clinical observation of the tooth contacts intraorally in centric relation will detect gross errors.
4. 2-3 layers of evenly soften Aluwax placed on the occlusal surface of maxillary posterior teeth. Carefully insert the trial denture in the patient's mouth and guide your patient gently closing into the centric relation position. Your patient may need to rehearse or practice the procedure several times. Patient needs to be reminded that make another centric relation record to verify your mounting.
5. Check the vertical relation of rest and the vertical relation of occlusion. Make sure they are satisfactory. Apply the tests used previously to record vertical relation such as phonetics and measurement. The patient should look normal. Excessive display of maxillary and mandibular teeth simultaneously should usually not be evident unless a deep vertical overlap exists. During sibilant sound production one or two millimeters of space should exist between the maxillary and mandibular first premolars. Patient should feel comfortable with the degree of jaw separation their trial dentures provide. Develop the ability to look at the patient and form an opinion as to whether their OVD

contributes to a normal appearance. Make nose to chin measurements at rest position. This should be 2-3 mm greater than the OVD. Teeth should not contact during speech sounds, especially the sibilant sounds. If the vertical relation should be increased or decreased, sometimes this change can be done directly on the articulator if the change is small (1-2 mm). A larger change of vertical dimension will require a new centric relation record made at the new vertical dimension of occlusion.

CONFIRM THE SELECTION AND ARRANGEMENT OF THE ANTERIOR DENTURE TEETH

- Midline harmony
- Relationship of anterior teeth to the lip
- Prominence of canines
- Antero-posterior position of anterior teeth (lip support)
- Occlusal plane
- Overall esthetic and phonetic factors

1. Verify the midline of the anterior arrangement. – the mid line should be centered to the philtrum of the upper lip when the patient is smiling. Mandibular midline should correspond with maxillary if a complete mandibular denture is being constructed. A discrepancy usually indicates an incorrect centric relationship.

2. Check the size, form, shade and arrangement of the teeth. Harmony and a pleasing natural appearance are the goals. The teeth should be observed from several angles to evaluate their mesiodistal inclinations and labiolingual inclinations. The occlusal plane must also be evaluated at this time. The dentures should be observed from distance when the patient is standing, sitting, talking and at rest. Observe the lip support when the prosthesis is/are in place. The labial flange(s) must be waxed to proper contour. The patient's lip should have proper support and a natural appearance.

3. Anterior teeth arrangement

Maxillary anterior teeth are set to provide natural lip support and position that is agreeable to the patient. The inclination of the maxillary six anterior teeth must be correct. Refer to denture technique handouts. Mandibular anterior teeth should be set slightly anterior to the crest of the ridge and non-interfering in protrusive position, especially for the first 2 - 3 mm of protrusive movement. Check the inclination of these

6 teeth carefully. A crossbite relationship may need to be established if the maxillary posterior teeth tend to be positioned too far buccally.

4. Phonetics should be evaluated at this appointment. During the conversation certain sounds should be observed carefully:

Sounds	Influenced by	Problems
Labial Sounds- P and B The labial sounds P and B are made at the lips. Air pressure is built up behind the lips and released with or without a voice sound.	a. Labiolingual position of the anterior teeth	Insufficient support by the teeth and denture base can cause these sounds to be defective.
	b. Thickness of labial flanges	
Labiodental Sounds - F and V "F" and "V" sounds are produced when the highest part of the lower lip is barely in contact with the incisal edges of the upper teeth.	a. Labiolingual position of upper anterior teeth length of upper anterior teeth	Difficulty in producing the "F" and "V" sounds is due to placing the maxillary anterior teeth too far lingually or placing the occlusal plane too high. V sounds like F - Uppers too short F sounds like V - Uppers too long
	b. Labiolingual position of lower anterior teeth	
Linguodental Sounds - TH (as in this, these) These sounds are made with tip of tongue extending slightly between the upper and lower anterior teeth	a. Thickness of the palatal denture base b. VDO	If this sound cannot be produced properly, it could be too much of a VDO preventing proper tongue placement
Linguopalatal Sounds - T and D T and D sounds are formed by contact of the tip of the tongue with anterior palate of linguals of anteriors	a. Position of maxillary anterior teeth Thickness of the anterior palatal denture base	Teeth too far lingual - T tends to sound like D Teeth too far anterior - D more like a T or denture too thick in rugae area
CH, J and S (related sounds) Upper and lower incisors should approach each other end to end	a. thickness of the denture bases lingual to the maxillary central	Lisping can be caused by excessive thickness lingual to the maxillary central incisors. A deep

but NOT touch S - "S" sounds are produced by air as it escapes behind the maxillary incisors near the center of the mouth between the tongue and palate.	incisors b. VDO	channel located lingual to the maxillary central incisors causes whistling. An "S" sound that sounds like the "sh" may be caused by too broad a channel lingual to the maxillary central incisors preventing contact between the tongue and the denture base in the premolar and molar region.
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C. CONFIRM THE ARRANGEMENT OF THE POSTERIOR DENTURE TEETH OCCLUSAL PLANE and THE PROTRUSIVE MAXILLOMANDIBULAR CHECKBITE RECORD

Use Fox occlusal plane to verify the reference plane was maintained during the laboratory denture teeth arrangement process.

Making a wax protrusive maxillomandibular record is the final procedure of the try-in appointment. Its purpose is to enable you to adjust the right and left condylar guidance controls of the articulator to conform to the general angular paths made by the patient's mandible in protrusive movement. Keep it in mind that the paths made by the patient's condyles are not straight, not solely dependent on the bony configuration of the glenoid fossae and the articular eminences. In fact, the condylar paths are resultants of anatomical bony configurations and the several physiological neuromuscular activities of the cranial musculature. Mandibular movement is a resultant of these several influences. We record mandibular protrusive movement in the mouth with a protrusive wax checkbite, transfer it to the articulator and later use this analog of mandibular movement to make articulator movements in balancing the articulation of the denture teeth in excursive movements.

- a. Chill and dry the trial dentures thoroughly, place the maxillary denture on the maxillary cast on the articulator.
- b. Detach the two holding elastics from the upper bow of the articulator and open the centric latches.

c. Heat the end of a sheet of Aluwax over a Microtorch or Bunsen flame, fold the end of it twice to make a 3-thickness strip of Aluwax 18 mm (3/4") wide. Cut this strip off the rest of the sheet of wax.

d. Cut the 3 mm thick Aluwax strip in half to make two shorter strips. Adapt them over the occlusal surfaces of the right and left mandibular posterior teeth, sealing them to the buccal and lingual surfaces of the teeth with firm finger pressure.

e. Soften just the Aluwax by immersing it in a waterbath at 140 degrees Fahrenheit for 10 seconds.

f. Place the mandibular trial denture on the cast on the articulator. Simulate straight protrusive movement of the articulator by moving the upper bow BACK 6 mm and slowly close the instrument so that the maxillary posterior teeth penetrate 1 mm into the Aluwax.

g. Chill the Aluwax with air-water spray with the articulator still closed. Then open the instrument, remove the trial dentures from the casts and chill them thoroughly in iced or chilled water.

h. Place the trial dentures in the mouth and have the patient practice protrusive closure by moving the mandible straight forward and tentatively closing into the hardened Aluwax impressions of the maxillary occlusal surfaces. Seating will not be precise nor complete but the patient is now familiar with the anteroposterior position of closure.

i. Remove the mandibular denture from the patient and reheat the Aluwax in the water bath for 10 seconds, being careful to preserve the impressions of the maxillary cusps in the Aluwax.

j. Re-seat the mandibular trial denture in the mouth, ask the patient to protrude the mandible, find the cuspal indentations in the Aluwax and gently close further into the wax.

You must observe this very carefully and tell the patient when to stop closing. The goal is for the patient to penetrate further into the wax without closing to any tooth-to-tooth contact.

k. Chill the Aluwax in the mouth with air-water spray and a cup of cold water. Remove the trial dentures from the mouth and chill the Aluwax thoroughly.

- l. Loosen the tall vertical screw posts on the articulator that keep the right and left condylar guides locked in position. Make sure that the condylar guides can now rotate back and forth freely.
- m. Replace the trial dentures on the articulator. Seat the maxillary posterior teeth into the cuspal indications in the hardened Aluwax. Seating will not be precise or complete. Place your hand on top of the upper bow of the articulator and exert steady pressure downward.
- n. Observing the left posterior maxillary teeth, rotate (wiggle) the RIGHT condylar guide forward and backward until the left posterior teeth settle precisely and completely into the wax cuspal indentations. Observing the right posterior maxillary teeth, rotate the left condylar guide back and forth until the right side teeth settle precisely and completely into the Aluwax indentations.
- o. Lock the condylar guide screw posts, observe the indicated angulation of the calibrated condylar guide angles; record them in the patient's chart and on their respective sides of the maxillary cast or mounting. The condylar guidances of the articulator are now closely analogous to the condylar travel paths of the patient's mandible when excursive movements are made.
- p. After re-attaching the holding elastics, removing the Aluwax and cleaning it from the mandibular denture you can now (or, in practice, your laboratory technician can) begin to re-set the teeth to the new centric relation (if you have re-mounted to a new CR record) and, if it was necessary, a new occlusal vertical dimension. Finally, you can balance the articulation accurately in excursive movements made with the recorded condylar guidances.

DENTURE TEETH ARRANGEMENT

Mandibular posterior teeth are set over the crest of the lower ridge. The posterior teeth must have approximately 1.5 mm of horizontal overlap to avoid cheek biting. Zero degree teeth must be set flat - perfectly flat - anterior-posteriorly and medio-laterally as indicated in the neutrocentric occlusion. This flat plane is oriented parallel to the mandibular ridge, in order to direct the occlusal force

CHECKLIST OF WAX TRIAL DENTURE

The dentures should not be sent processed until the patient is satisfied with the trial denture.

✓	Centric Relation
✓	Midline
✓	Occlusal Vertical Dimension
✓	Lip Support/Waxed to Full Contour
✓	Anterior denture teeth arrangement
✓	Posterior denture teeth arrangement
✓	Buccal Corridor
✓	Occlusal Plane
✓	Shade selection of the denture teeth and the denture base acrylic
✓	Phonetics (Closest Speech Space and Sibilant Sound Clarity)
✓	Overall Appearance (Size, Position, Form, and Arrangement)
✓	Maxillary Posterior Extension (posterior palatal seal)

OCCLUSAL CONSIDERATION for EDENTULOUS PATIENTS

Terminology

- **Long Axis.** An imaginary longitudinal line around which the crown of a denture tooth is most symmetrically distributed.
- **Inclination.** When a denture tooth is positioned on a record base, its long axes may be inclined in a variety of directions to simulate the orientation of natural teeth in dental arches. The *inclination* of a denture tooth is the deviation of its long axis from a vertical axis of reference. Four kinds of inclinations are commonly described as *facial*, *lingual*, *mesial*, and *distal*. For example, a tooth has a *mesial inclination* when its long axis slants so the incisal or occlusal end is more towards the midline than the gingival end. A tooth has a *facial* inclination when its long axis slants so the *incisal* or occlusal end is closer to the cheek or lips than its gingival end.
- **Maximum intercuspation position.** The intimate, centered, contact position of the occlusal surfaces of mandibular teeth on the occlusal surface of maxillary teeth.
- **Excursion.** Any mandibular movement that has centric occlusion for a starting position (*lateral excursion*, *protrusive excursion*).
- **Working Side-Working Articulation.** The *working side* is defined as the side to which the mandible moves in a lateral excursion. The term *working occlusion* refers to the contact relationships between maxillary and mandibular teeth on the working side. As an example, in cases demonstrating anterior guidance, the working occlusion has maxillary and mandibular anterior teeth in contact with separation evident between upper and lower posteriors.
- **Balancing Side-Balancing Articulation.** The *balancing side* is the side opposite the working side. The term *balancing occlusion* refers to the contact relationships between maxillary and mandibular teeth on the balancing side. For example, in a monoplane complete denture using 0° teeth, all of the teeth on the balancing side are in contact.

- **Protrusive-Protrusive Articulation.** A *protrusive jaw relationship* is any relation between the maxillae and mandible where the mandible is thrust *forward*. *Protrusive occlusion* refers to contact relationships between maxillary and mandibular teeth when the mandible is in a forward position. For example, when balanced complete dentures are in protrusive occlusion, there are multiple anterior and posterior tooth contacts on the right and left sides.
- **Eccentric Occlusion.** Any mandibular position where teeth contact in other than centric occlusion.
- **Horizontal Overlap.** The projection of the maxillary teeth over their mandibular opponents in a horizontal direction when the dentition is in centric occlusion.
- **Vertical Overlap.** The projection of the maxillary teeth over their mandibular opponents in a vertical direction when the dentition is in centric occlusion.
- **Compensating Curve.** A combination of anteroposterior and lateral curves incorporated into balanced occlusions for purposes of producing multiple working side, balancing side, and protrusive contacts. **The anteroposterior component of the compensating curve is called the Curve of Spee, and the lateral of transverse component is called the Curve of Wilson.**

It is the dentist's responsibility to confirm the proper jaw relationship and accurate measurements in the patient's mouth. The denture teeth arrangement then can be harmonized with these limiting factors. There are at least three objectives in setting or arranging denture teeth:

- to achieve the maximum chewing function and stability,
- to avoid any interference with the patient's speech,
- to restore the natural appearance.

What are the goals of dental occlusion?

- Minimize trauma to the supporting structures (Preserve remaining structures)
- Enhance stability of the dentures
- Facilitate esthetics and speech
- Restore mastication efficiency to a reasonable level

Once the master casts have been mounted on the articulator, the teeth are set in wax rims. The consideration of OCCLUSAL SCHEME should be started before finalizing the selection of denture teeth.

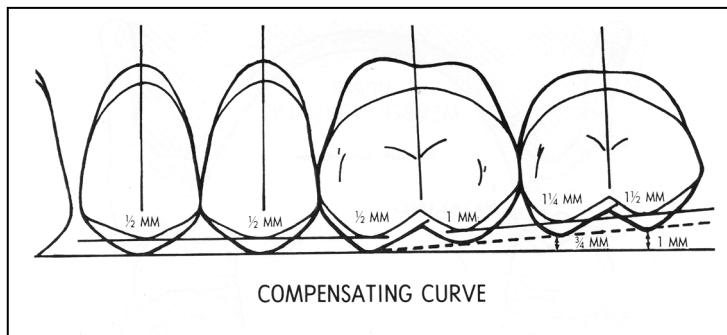
The commonly used concepts in denture occlusion are:

- A. BALANCED DENTURE ARTICULATION (as described in chapter 18 for 30° Pilkington Turner teeth and chapter 20 for 20° degree denture teeth arrangement)
- B. Neurocentric arrangement (as described in chapter 19 for 0° degree teeth arrangement)
- C. Lingualized articulation(as described in chapter 22)

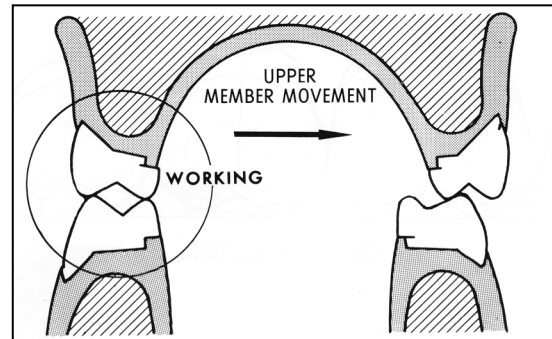
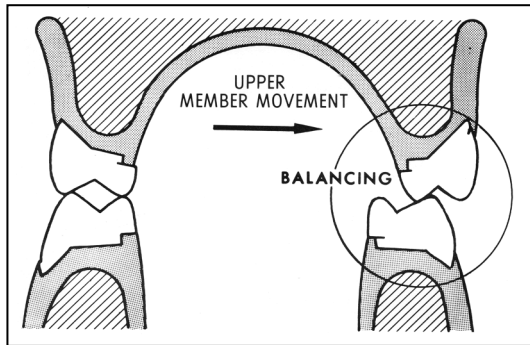
A. Bilaterally Balanced Occlusion

This is the occlusal scheme we selected for our typodont patient. Balanced occlusion is an occlusion scheme which presents a harmonious relation of occluding surfaces in centric and eccentric positions within the functional range. The other word, it provides bilateral, simultaneous, anterior and posterior occlusal contact of teeth in centric and eccentric positions. Because of compromises inherent in restoring the edentulous arch, complete denture tooth forms and arrangements (i.e. occlusion), should be designed to provide function and aesthetics while minimizing denture base tipping (lateral) forces

- The articulator requires protrusive records to program the condylar guidance.
- The anterior teeth are arranged to have a 1-2 mm of horizontal overlap 0.5 to 1 mm for the vertical overlap.
- **The anteroposterior compensating curve** is formed by gradually elevating the lingual cusp tips.
- **The mediolateral compensating curve** is formed by elevating the buccal cusp tips further away from the occlusal plane.
- Usually requires selecting anatomical denture teeth



- The more steep the cusp angle is, the more difficult to achieve balanced occlusion arrangement.
- The constant occlusal contacts during excursive movement will help stabilize the denture bases.

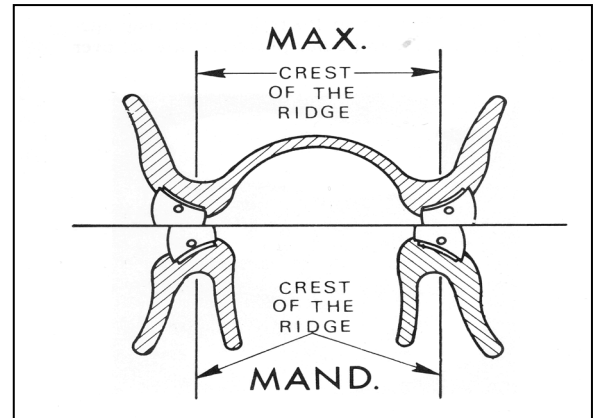


<u>ADVANTAGE OF ANATOMIC TEETH</u>	<u>DISADVANTAGE OF ANATOMIC TEETH</u>
a. Tooth-to-tooth and cusp-to-cusp balanced occlusion can be achieved.	a. More difficult and time consuming to balance
b. Definite point of positive intercuspation may be developed	b. Settling can result in more damaging interferences
c. Esthetically similar to natural dentition	c. Possibilities of more lateral stress in function
d. Greater chewing efficiency, excessive chewing pressure minimized	d. Harmonious balanced occlusion is lost with denture base settling
e. Maintains some shearing ability after moderate wear	e. Requires frequent follow-up and may require more frequent relines to maintain proper occlusion

B. Monoplane occlusion-

a. Neutrocentric occlusion-

- This concept of occlusion assumes that the anterior-posterior plane of occlusion should be parallel to the denture foundation area and not dictated by condylar inclination.
- The plane of occlusion is completely flat and level. There is no curve of Wilson or Curve of Spee (compensating curves) incorporated into the set up.
- There is no vertical overlap of the anterior teeth.
- When using this concept of occlusion the patient is instructed not to incise the bolus. With this tooth arrangement DeVan noted that “the patient will become a chopper, not a chewer or a grinder.”
- When setting these teeth the horizontal and lateral condylar guidance should be set at zero.
- The arrangement of the posterior teeth maintains a flat horizontal anteroposterior plane which is parallel with the plane of denture foundation. Mesiolaterally, the teeth are also set in a flat occlusal plan without any inclination.
- The condylar guidance can be set at 0 degrees. The articulator is used as a hinge articulator just for the opening and closing movement.
- The mandibular teeth are set on the ridge. In some occasion, the number of posterior denture teeth could be reduced to direct the occlusal forces better on the flat ridges.



<u>ADVANTAGE OF NON-ANATOMIC TEETH</u>	<u>DISADVANTAGE OF NON-ANATOMIC TEETH</u>
Reduction of horizontal forces	No vertical component to aid in shearing during mastication
CR can be developed as an area instead	Occlusal adjustment impairs efficiency unless

of a point	spillways and cutting edges restored
Freedom of movement	Patients may complain of lack of positive intercuspation position
Can develop solid occlusion despite arch alignment discrepancies	Somewhat esthetically limited (don't look like natural teeth)
Easily adapted to situations prone to denture base shifting	
Easy to set and adjust teeth	
Best for patients with poor muscular control and for patients with poor ridge relationships	

WARNING: NSU-CDM CLINICAL PROTOCOL for monoplan denture teeth arrangement is Neutrocentric(NON-BALANCED) articulation!

But, for your information, monoplan teeth could also be arranged to a bilaterally balanced occlusion! Please beware: the following introduction of technique will not be used as a core technique for NSU CDM predoc clinical patients.

b. Non-Anatomical teeth arranged to a balanced occlusion

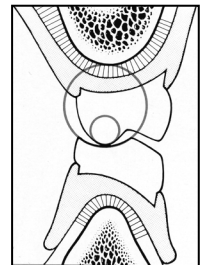
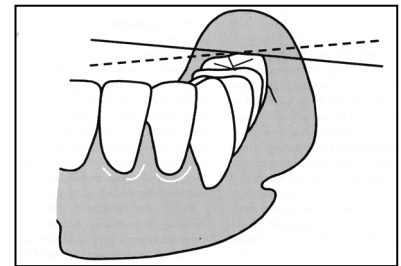
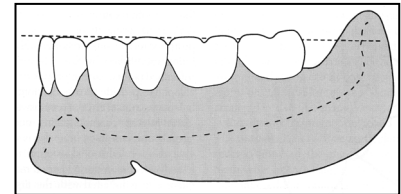
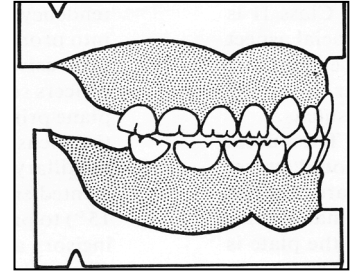
There are 2 techniques to achieve the balanced articulation

1. Balancing ramp

tipping the mandibular 2nd molars to create an antero-posterior curve, or using wax to create a 30 ° ramp distal to the 2nd molars.

2. Arranging the monoplane teeth following compensating curve

- No more than 3 teeth on each side were set
- The anterior teeth- no vertical overlap, 1-2 mm horizontal overlap
- **The anteroposterior compensating** curve starts from the canine towards the retromolar pad, the mesial cusps of 1st molar is leveled with occlusal plane, the distal cusps of the 1st molar start to elevated above the plane of occlusion. The Distal of the 2nd molar is above the top of the retromolar pad.
- The extent of the curve should not be more than 20 degrees.
- **The mediolateral compensating curve** is formed by slightly elevating the buccal cusps of the posterior teeth above the lingual cusps.
- The curve usually does not exceed 10 degrees from the horizontal plane.

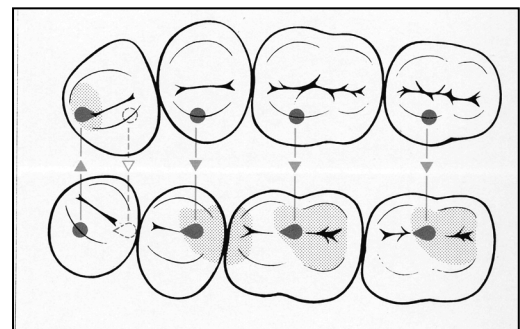


Lingualized Occlusion

Lingualized occlusion is a type of balanced occlusion.

It utilize the maxillary anatomical teeth and the mandibular non- anatomical teeth to achieve an occlusal scheme that during the centric occlusion contact only the lingual cusps of the maxillary teeth

contacting the central fossa of the mandibular teeth. It still provide the balancing contacts during the excursive movements. It also provide the esthetic value for using the maxillary anatomical teeth.



Comparison of the 3 occlusal schemes

Characteristic	Non-Anatomical	Bilaterally balanced Anatomical	Lingualized occlusion
Esthetics	-	+	+
Ease of cutting food	-	+	+
Denture stability during excursive movements	—	+	+
Simpler technique Less precise record	+	—	+
Decreased lateral force	+	—	+
Ease of adjustment	+	—	+
Good for Class II And Class III jaw relations	+	—	+
Good stability, Forces centralized	+	—	+

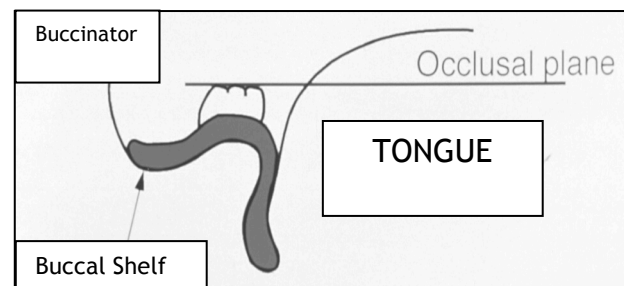
CHAPTER 24

COMPLETE DENTURE WAX UP and FESTOONING

1. Palate of maxillary denture should be even in thinness, provide room for the tongue, and not interfere with speech. The palate may be completely smooth or have rugae in the anterior portion.

2. The denture must be self-cleaning. Holes or rough areas provide food traps. Interdental papillae must be smooth and flat or slightly convex (never concave!)

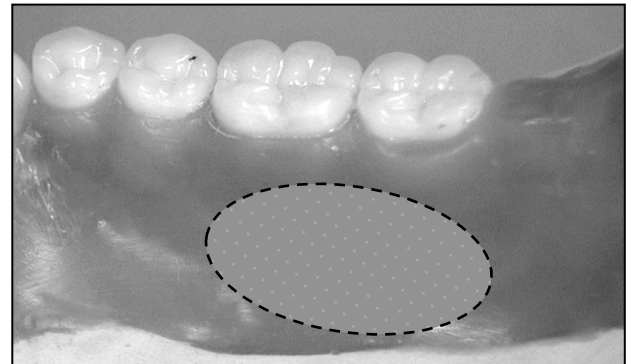
3. Lingual flange of mandibular denture may be slightly concave but not so much as to cause dislodgment of the denture by the tongue.



4. The denture should appear natural. Natural teeth do not have grooves between them nor should denture teeth.

5. Light should deflect off the denture. This can be accomplished by stippling in the wax-up or on the processed acrylic denture.

6. The denture must replace lost bony structure; therefore the canine eminence at the corner of the mouth and the gingival bulge on the buccal are very important.



7. The denture base must be uniform in outer thickness. Lumps and bumps are very uncomfortable, draw attraction to their presence and provide a site for debris accumulation.

8. The waxed denture is exactly duplicated. Care must be taken to wax the denture exactly as you wish the final denture to appear.

9. The posterior palatal seal helps retain the denture and must be performed before the denture is sealed down and processed.

PROCEDURE:

Maxillary:

The palate of the baseplate is removed and replaced with two thickness of baseplate wax to provide for uniform thickness of the palate of the denture.

1. Remove Palate

Use die saw to remove the palate of the baseplate by cutting as close to the lingual surfaces of the maxillary teeth as possible. Use care not to exert pressure on the baseplate as this can result in breakage or warpage. Let the blade do the cutting.

Smooth the edges of the baseplate. Be certain not to leave a ridge of acrylic particularly on the tissue side. Place the baseplate back on the cast and recheck the occlusion and tooth alignment. Make corrections if necessary.

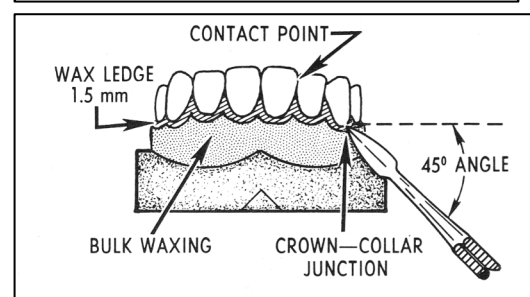
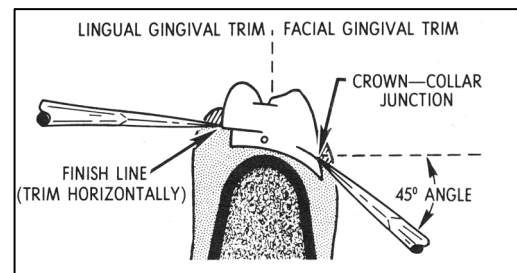
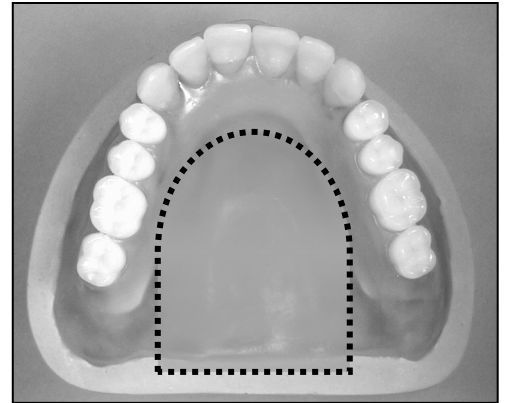
2. Add Wax to Palate

Remove maxillary mounted cast from the articulator. Flow a thin film of wax over the palate area of the cast. Roll a piece of baseplate wax by folding it over 3 times so that it is approximately 5 mm wide. Soften the roll and flow wax to the lingual of the teeth (as shown in waxing demonstration).

Adapt one sheet of softened baseplate wax over the palate. Seal and smooth the wax with a spatula and/or torch. Extend the sheet of baseplate wax to the posterior border of the posterior palatal seal. Flame and smooth palatal surface with Hanau torch.

3. Carve Palatal Surface

Use the knife end of a Roach carver to carve wax on the palatal side of posterior teeth 20 below the horizontal palatal Plane. The angel will be greater on the side of anterior teeth.

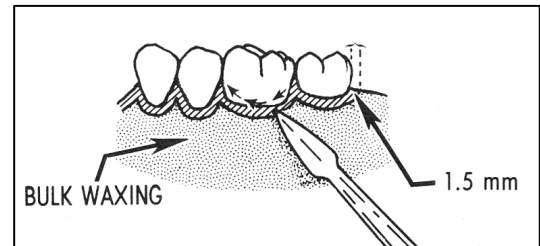


Remove ALL wax from the lingual of the teeth above the collar or finish line. Flame and smooth with Hanau torch. Use sharp instrument to remove any remaining wax around the gingival margin of each tooth.

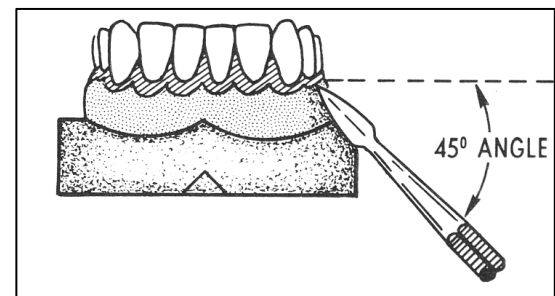
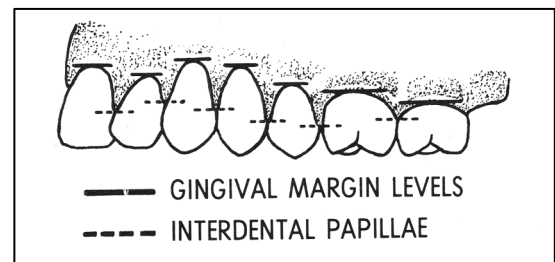
4. Contour Facial and Buccal

Flow thin layer of wax onto the baseplate and around the necks of the teeth. Adapt a softened roll of wax along the facial surface of the baseplate. Be certain to have full extension of the borders.

Contour the wax to form fullness or convexity above the anterior teeth to simulate attached gingiva. Contour prominent canine root eminence that stops short of the border. Contour root eminence over centrals (not as prominent as canines). Prepare slight depression over laterals.



Contour "gingival bulge". Bulge is almost nonexistent above the 1st bicuspid. Starts over the 2nd bicuspid and widens as it travels to the distal of the 2nd molar. Place a slight depression in the premolar area. This is the canine fossa and is important if normal facial expression is to be obtained. Place a slight concavity along the buccal between the gingival bulge and the peripheral roll.



5. Carve Wax Around Buccal and Facial of Teeth

Seal the wax with a hot spatula around the necks of the teeth. Be sure to adequately seal the wax so that it will not separate, flake or chip when carved. Trim around the necks of the teeth with a Roach carver at the junction of the collar and crown.

Remove all remaining wax from teeth. Carve to produce a convex interdental papilla. Gently flame with Hanau torch to produce a smooth gingival margin. After

flaming use a small sharp instrument to remove any wax around gingival margins of each tooth.

Mandibular

1. Lingual

Flow wax on the lingual surfaces of the teeth and carve gingival margins to an angle of up to 20 below the horizontal on posteriors and 45 on anteriors.

Wax the posterior lingual flanges from the teeth to the peripheral roll making an incline plane that slopes toward the tongue and is not convex. It may be slightly concave but not so much as to cause the tongue to dislodge the denture.

Contour and wax the distolingual area of the flange so that it blends into the retromylohyoid space. The peripheral roll should be rounded and completely fill the mucolingual sulcus of the cast. Flame and smooth with torch.

2. Labial and Buccal

Wax a small gingival bulge just below the gingival margins of the four incisors (similar to the bulge on the maxillary). Wax canine eminences (not as prominent as on the maxillary).

Posterior gingival bulge should be convex with no root prominence. Place concavity between gingival bulge and peripheral roll. Carve gingival margin and remove all excess wax from teeth.

Contour interdental papilla. Flame to smooth. Use sharp instrument to remove any wax around gingival margins of each tooth.

Seal Maxillary and Mandibular Dentures to Cast

Use a narrow roll of baseplate wax to add a very thin line of wax around the entire periphery of each denture. Use a hot spatula to seal and smooth the wax. Make sure to blend this additional wax into portions already waxed and take care not to distort or ruin work already done.

Place mounted casts back on articulator. Check occlusion and tooth alignment. Adjust occlusion and rewax if necessary.

CHAPTER 25

The Occlusal Remounting Index

Introduction:

When treating an actual patient with complete dentures, the final occlusal corrections and refinements are made at the appointment when the processed, finished dentures are fitted, adjusted and delivered. The final occlusal corrections are made AFTER the initial fitting and preliminary border and tissue surface adjustments are made. The occlusal refinement is NOT an intra oral procedure. It is performed in the laboratory after the dentures are re-mounted on the articulator. The dentures are remounted with wax interocclusal records (called "wax checkbites") made in the mouth with the patient closing the mandibular denture teeth into strips of wax attached to the occlusal surfaces of the posterior teeth of the maxillary denture. The mandible is closed in centric relation.

To enhance the accuracy of the occlusal corrections the maxillary denture should remain in the proper angular and positional relationship to the opening axis of the mandible and of the articulator. This means making a new facebow record and transfer to mount the maxillary denture on an new "remount cast" OR it means preserving the original position of the maxillary cast relative to the opening axis of the mandible/articulator as the last step before the waxed dentures are processed. This is accomplished by recording of the incisal edges and occlusal surfaces of the waxed-up maxillary denture as they relate in position, angle and relationship to the opening axis of the articulator.

PROCEDURE

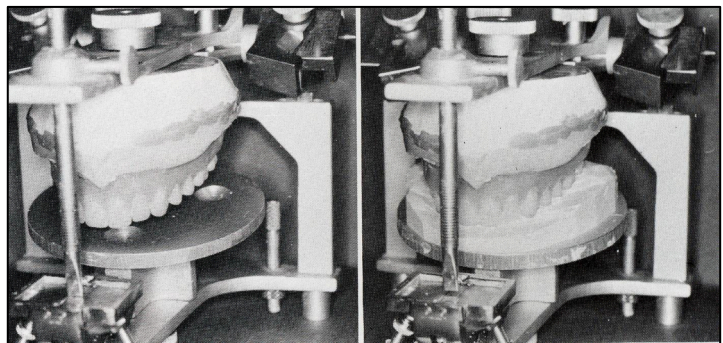
- a. After completing the final waxups of the dentures and sealing them to the casts remove the mandibular denture, cast, and mounting from the articulator.
- b. attach an empty mounting ring to the mandibular bow of the instrument.
- c. Wrap boxing wax around the mandibular mounting ring to form a chimney whose height is as precisely as you can make it, as high as - and no higher than - the incisal edges of the anterior teeth of the maxillary trial denture and the tips of the cusps of the posterior teeth. Make sure the wax chimney is wide enough so that the incisal edges and cusp tips are within its periphery.

d. Fill the chimney with a mix of plaster than CAREFULLY close the articulator completely so that the incisal pin rests squarely on the guide table. Only the incisal edges and cusp tips should penetrate the surface of the soft plaster. Keep the plaster off the axial surfaces of the teeth and off the wax. You now have an occlusal remounting index.

e. Keep the occlusal index. You will use it later to remount a new maxillary remounting cast. This will be done after the maxillary denture is removed from the maxillary master cast, finished and polished and BEFORE the delivery appointment. During the delivery appointment you will need to remount the mandibular denture (on a new mandibular remount cast) with a wax checkbite made in the mouth in centric relation position.

Alternative technique-remount jig

method



You can also create an plaster remount record over the remount jig that will allow you to remount the

maxillary denture. This procedure is done after the maxillary and mandibular complete dentures have been waxed and festooned, sealed to the cast, ready for processing, and, BEFORE they have been separated from their mountings.

Remove the mounted mandibular denture from the articulator. Place the Remount Jig on the lower member of the articulator. Lightly lubricate the top of the remount jig with Vaseline or model releasing agent. Notice the three orientation notch need to be carefully lubricated.

Next, box the horizontal platform of the remount jig by adding a strip of boxing wax vertically to a height that extends 1/8 inch above the maxillary occlusal surfaces. In other words, the incisal edges and occlusal surfaces should barely be covered. Similar steps(d and e) should be followed .

The benefit of using remount jig is the plaster index can be separated from the jig and preserved for remount procedure at delivery. At the same time, the jig can be used for other cases.

CHAPTER 26

PROCESSING AND FINISHING DENTURES

A. DEFINITION:

A process that substitutes acrylic resin for the baseplate material and wax that makes up the denture base. The contours of the basal seat and the external surface will be accurately reproduced and the denture teeth will be retained in their correct position.

B. PURPOSE:

To produce an acrylic resin denture base containing teeth.

C. INSTRUMENTS AND SUPPLIES:

1. Upper and lower investing and processing flasks
2. Plaster bowl and spatula
3. Waxed denture on master casts.
4. Glass jar and metal spatula
5. Acrylic resin - monomer and polymer
6. Measuring vials
7. Plaster shears and plaster saw
8. Brush
9. Tin foil substitutes
10. Acrylic trimmers - burs and stones
11. Rag wheel
12. Felt wheel
13. Pumice and green polishing compound
14. Flask press

D. PROCEDURE:

1. Flasking:

The flasking procedure is the placing of the waxed denture bases and teeth in suitable investing media in preparation for wax elimination and packing of acrylic resin in its place. Plaster and stone, contained within a split metal flask, are the investing materials because of their hardness and ability to reproduce surface detail.

Lubricate the artificial denture casts on all exposed surfaces with Vaseline. (At this stage the wax form should be sealed to the stone base around the entire periphery.)

Prepare the appropriate flask by lubricating all internal surfaces with Vaseline. Note that most processing flasks contain a lid, an upper and lower component (divided according to whether it is used for an upper or lower denture) and a bottom knock out disc.

Each denture is first invested in the lower half of the respective flask. Make a mix of plaster and place it into the flask. Position the cast into the plaster allowing the excess plaster to squeeze upward around the periphery. Trim off excess plaster so that it is flush with the land area of the casts and clear of the flask lip. The depth to which the cast is placed into the plaster is determined by the height of the teeth in relation to the top of the flask. Therefore it is advisable to place the upper half on the flask, without the lid, to make this determination. A minimum of one half inch clearance from the top of the flask to the teeth is essential. No difficulty will be experienced if the cast thickness is correct as described in the procedure for pouring and trimming the master cast. the cast may be further pressed into the plaster until the correct height is achieved. This must be accomplished while the plaster is still soft and all excess should be removed after each manipulation. Allow plaster to set a minimum of 20 minutes. Trim and smooth all paste surfaces. Remove excess plaster edges so that the halves of the flask can be placed in opposition.

Apply tin foil substitute to the exposed plaster and stone surfaces. The separator is painted on with a brush until a shiny surface is attained. Allow the separator to dry. Place the upper half of the flask in place without the lid. Make a mix of plaster and vibrate it into the flask up to the limit of the occlusal third of the teeth. The amount of plaster needed will depend upon the size of the denture. In most cases the amount normally used for 2 models is sufficient.

Prepare a mix of stone (enough for 1 model) and carefully apply it to the occlusal portions of the teeth. Vibrate additional stone into the flask to slightly overfill it. Place the lid on and press completely to place, allowing excess stone to squeeze out of the lid holes. Clear excess stone and place the flask in a press under light pressure. Artificial stone is used over the teeth because its greater strength will better resist pressures against the teeth during packing. Allow the stone to set for 45 minutes.

2. Wax Elimination:

Immerse the flask in boiling water for 5 minutes to soften the wax. Remove from water and carefully pry open the flask halves. Peel away the baseplate and unmelted portions of wax. Note that the teeth are retained in the upper half of the flask. Clear all traces of wax from all surfaces and teeth by flushing repeatedly with clean boiling water.

3. Packing:

Allow the flasks to cool to room temperature and paint all surfaces. EXCEPT THE TEETH, with tin foil substitute until shiny.

Prepare a mix of acrylic resin sufficient for a denture (30 gr polymer to 10 cc monomer is enough for the average case). Follow manufacturers' directions for proper mixing and packing consistency. The proper consistency suitable for packing is in the doughy stage. There are methods of packing; trial pack closure and single pack closure.

For trial pack closure, acrylic is placed into each half of the flask in slight excess and a sheet of plastic is placed between the halves before closure. The flask is slowly compressed in a (pneumatic) press and the pressure was slowly raised to 1500 psi, allowing excess acrylic to slowly squeeze out between flask halves. The flask is opened and excess acrylic can be added if necessary and the process repeated as the pressure increases 1000 psi each cycle until complete closure is achieved. Usually 2 to 3 trial pack cycle should be enough. The final closure will not contain the plastic sheet. When applying the acrylic to the molds, care should be exercised so that the teeth are not lifted or moved. The packing pressure should be moderate and applied gradually as the excess acrylic escapes. Great pressure can be directed at the teeth during closure which can displace or intrude them into the investing material.

4. Curing:

The flasks should remain under pressure for at least 15 minutes. This is known as bench curing and lets the acrylic equalize its flow before curing. If 2 dentures are to be cured, they may be transferred to a double processing press.

There are 2 ways to complete the heat cure process of the denture base resin:

Long cure: bring the water temperature of the tank to 160 degree. Leave the flask in the tank for 8-10 hrs. And then the flasks are removed from the tank and allowed to bench cool.

Short cure: An alternative method is leave the flasks in the 160 F tank for 1 ½ hours, followed by another hour at boiling. The flasks are removed and allowed to bench cool.

5. Recovery (Deflasking):

Removing the flask lid by wedging an instrument in the notch that is provided on the flat end of the flask. Using a mallet, tap the insert disc at the bottom of the flask until the investment is dislodged from the flask. Using plaster shears or nippers, chip the plaster from around the periphery of the stone cast until the base is exposed. Using plaster saw and shears remove all plaster until the denture is exposed. The plaster should be removed in small increments so that the acrylic, the cast nor the teeth are fractured. You should recover a processed denture base containing teeth attached to a stone master cast.

6. Occlusal Correction (a.k.a., Laboratory Remount):

The recovered dentures are luted to their original mountings with sticky wax or compound and then replaced on the articulator. The accuracy of the occlusal should be checked. The most common fault found is an increase in vertical dimension (incisal pin open-not on the incisal table) due to the slight excess in the flask. An occlusal error up to 3/4mm is acceptable and can be corrected by occlusal alteration. Follow the procedure for selective grinding until the correct vertical dimension (incisal pin is again flush on the incisal table) and balanced occlusion is obtained.

7. Finish:

After equilibration is completed, the denture is removed from the stone casts using a plaster saw and shears. Acrylic may crack or fracture if excess pressure or wedging forces are exerted. Remember that parts of the ridge configuration may contain undercuts which will hold the denture fast. These areas must be chipped away carefully. Trim all gross excess acrylic down to the original waxed denture form, being careful not to remove the following:

- Buccal, facial and lingual fold contour
- Post-dam area
- Gingival festooning around the teeth
- Surface contour and root eminences

Inspect the tissue side of the dentures for small blebs due to voids in the casts. Remove these with burs.

Finish the external surface and peripheral fold with rubber wheels to remove gross defects and to impart final contour.

Using a wet rag wheel mounted on a lathe, polish the external surfaces up to the peripheral fold with medium pumice followed by fine flour of pumice until all scratches are removed. It is advisable to use the low speed on the lathe in order to better control the amount of polish. Maneuver the denture so that the depressed or concave areas are polished. Maintain the surface contour during this procedure. Final impart a high shine on the same areas using a felt wheel and green compound. Note that the tissue surfaces are not altered or shined.

CHAPTER 27

Clinical visit #5

INSERTION AND OCCLUSAL EVALUATION

A. DEFINITION:

Insertion is the intraoral placing of a dental prosthesis and evaluation of the occlusion using a clinical remount procedure.

B. OBJECTIVE:

To test the retention and stability of a denture, to correct any occlusal disharmonies and to have a patient wear this denture home. The student must also be able to correctly answer questions on denture insertion and occlusal equilibration on a written examination.

C. INSTRUMENTS AND MATERIALS:

1. Mouth mirror
2. Handpiece and suitable stones
3. Maxillary "remount cast" on articulator
4. Mandibular "remount cast"
5. Articulating paper
6. Aluwax
7. Pressure Indicating Paste (PIP) with brush or Q-tips
8. Thompson's indicator sticks

D. PROCEDURE:

A. Pre-Delivery (Laboratory)

Pre-delivery correction of occlusal discrepancies.

It is to be expected that discrepancies of occlusion resulting from laboratory processing of the dentures will have been corrected in the laboratory remount process, as described in chapter 26, prior to the denture delivery appointment.

B. Pre-Delivery (office or clinic Laboratory)

When the dentures are completed and received from the laboratory several procedures should be accomplished BEFORE the patient's delivery appointment. These serve to enhance the patient's comfort and save time at the delivery.

1. Examination of the Dentures:

Examine the dentures carefully to note proper processing of the acrylic resin bases, absence of porosities and irregularities and nodules of the acrylic resin.

Palpate all of the tissue surfaces of the dentures. Palpation will often reveal small areas of roughness or nodules in the tissue surfaces of the denture bases that result from minor defects of the master cast. Similarly, palpation of the polished surfaces of the dentures will reveal nodules or roughness that result from defects of the wax patterns or the flasking investment.

Correct these nodules and rough areas by carefully reducing them with acrylic resin trimming burs gently applied. This will avert tissue impingements that result in patient soreness, inflammation or ulcers.

2. Making Remount Casts for Remounting

Accurate remounting casts are easily and quickly made. They may be made by the commercial laboratory after the dentures are processed and finished or they may be made in your office or clinic lab. The goal is to fabricate casts on which the dentures can be easily placed and removed and on which the dentures will be held during final refinement of the occlusion on the articulator.

a. Fill in all the undercut areas of the tissue surfaces inside the dentures with a temporary blackout medium. For this purpose, wet pumice, wax or wet tissue paper can be used.

In addition to the above, prior to the patient's arrival, remount casts should be made. The undercuts are blocked out of the maxillary denture using wet pumice or wet paper towel.

b. After blocking out the undercuts, place a thick mix of laboratory plaster inside the denture bases and invert the dentures into a mound of plaster. The dentures should be seated far enough into the plaster so that the plaster engages and overlaps the entire length of the denture borders (except for the posterior borders of the dentures). The plaster should overlap the borders by 2 mm (and avoid engaging undercuts of the polished surfaces of the dentures).

c. After the plaster is set, remove the denture from the cast, remove the blackout material from the denture and rinse it. Trim the cast to provide a land area 2-4 mm wide and a base 10 mm thick at its thinnest point. The dentures should seat firmly on the

casts yet be easily removed (as will be the case if the undercuts were properly blocked out).

3. Remount the Maxillary Cast

- a. place an empty mounting plate on the maxillary bow of the articulator
- b. attach the plaster remounting occlusal index previously made before the dentures were processed to the mandibular bow of the articulator.
- c. place the maxillary denture on the maxillary remount cast. Seat the incisal edges and occlusal surfaces of the denture teeth in their indentations in the remounting occlusal index
- d. mount the maxillary cast to the articulator
- e. clean the maxillary denture
- f. store the dentures immersed in a sealed container of disinfectant until the delivery appointment.

III. The Delivery Appointment

1. Pre-delivery request to patient:

It is most beneficial to the patient for his old dentures to be out of the mouth for the longest possible interval before the completed new dentures are inserted in the mouth for the first time. First of all, the old dentures, having usually been worn for years, in all likelihood do not fit the present form of the ridges since we must assure that considerable ridge resorption has taken place and that the old dentures are forcing the soft tissues over the ridges into a non- physiological form. Most patients, indeed, acknowledge that their old dentures do not fit well upon initial insertion in the mouth in the morning; retention improves after more or less time in the mouth as the soft tissues are forced into an unrelaxed configuration to conform to the dentures..

PRACTICE PEARL: Final impressions of edentulous ridges should be made after the maximum interval of time in which the old dentures have been out of the mouth. First appointment in the morning is a good time for final impressions. Request that the patient leave the dentures (as usual, we hope) out of the mouth during the previous night's sleep and not insert them on the morning of the final impressions until after the procedure. Be sure to explain the benefits of doing this.

Those patients who, for social reasons or because they are personally embarrassed to be seen by anyone sans dentures, should be accommodated by allowing them to sit in

the operatory in seclusion for an hour prior to impression making with dentures out of the mouth and reading material in hand.

Similar procedures are advisable for the delivery appointment. A second very potent reason for doing this is the advisability of a prolonged interval for the patient to have nothing in the mouth, to allow some-at least- loss of tactile memory to develop. This minimizes comparison of how the new dentures feel (strange) as opposed to the old ones (comfortable, familiar and "old shoe"). Carefully explaining this to patient at the appointments before the final impression appointment and the delivery appointment will combine to alert the patient to the physiological and morphological changes that have gradually taken place over the years in the edentulous mouth and the changes of configuration of the new dentures resulting from those changes.

2. In The Operatory- Procedure

A. Initial seating of the Dentures:

The patient is seated comfortably. Pressure indicator paste (P.I.P) is applied to the entire tissue surface and border areas of both dentures. (Explain the purpose of this procedure to the patient). Seat the dentures in the patient's mouth carefully. If there are any undercuts of the ridges deep enough to resist initial seating of a denture, do not force the denture to place but rather remove the denture from the mouth and examine the tissue surface. Areas of the tissue surface resisting seating of the denture base because of undercuts of the ridges will be quite evident because the P.I.P. will have been wiped away from the denture base in the areas of impingement on the ridge. Relieve (gently) these areas of the denture with an acrylic resin trimming bur, re-apply the P.I.P. to the denuded areas and repeat seating of the denture as many times as it takes for the denture to seat completely without resistance.

When both dentures are fully seated on their ridges, have the patient close, but not to occlusal contact. Rather, interpose a cotton roll between the maxillary and mandibular first molars on each side and ask the patient to exert moderate, steady occlusal closure force for 30 to 60 seconds. Remove the dentures from the mouth and examine the tissue surfaces for areas of impingement or heavy pressure. These will exhibit local areas where the P.i.P has been forced completely away from the denture base. Gently relieve these areas by "shaving" them with the acrylic resin trimming bur. Do not, however, relieve the post-palatal seal areas of the maxillary denture at this appointment

unless the patient complains of a painful impingement in the area. This general area should exhibit denudation of P.I.P.-from the denture base. We have scored the maxillary post palatal seal area of the cast so that the denture base will apply extra pressure in this region, developing a good seal for the posterior border of the denture and promoting maximum retentive force. If the pressure in this area is excessive, it will become evident to us and especially to the patient by the time of the first recall appointment in two days.

Repeat seating of the P.I.P. coated dentures until all other areas of heavy impingement have been eliminated. Make sure there are no evident border impingements. Pay special attention to the frenum attachments and make sure the corresponding notches in the borders provide adequate clearance. The labial frenum especially, is a possible source of impingement because this frenum tends to be the most active during masticatory and phonetic function.

B. Border Thickness:

Border molding prior to the final impressions should have achieved ideal border extension and thickness in every area. You may find, however, that after initial seating, the patient's upper lip in the anterior (subnasal) area appears overly full. This is a condition that may resolve as the patient's perioral musculature relaxes in response to the new dentures. If it does not, the maxillary anterior border can be made thinner at subsequent appointments, generally without compromising retention at all.

C. Patient Perceptions

(1) At an early stage of the delivery appointment, allow the patient to view his new dentures in a mirror. This should be a gratifying moment for everybody and you should allow the patient to take maximum advantage of it.

(2) Retention: At this stage excellent retention of the dentures is a highly desirable outcome. It may, however, be less than anticipated (especially for the mandibular denture). You must reassure the patient that it will improve as his lips, tongue, cheeks and reflexes accommodate to the new prosthesis. It may be advisable in extreme situations when the mandibular residual ridge is extremely atrophic to instruct the patient in the proper use of an appropriate denture adhesive during the early "learning" phase of functioning with

new dentures. At this time, it may be best to divert the patient's attention to the good esthetics of the dentures that you have both achieved in your joint efforts.

D. Refining (equilibrating) Articulation (Anatomical or Semianatomical Teeth)

"Occlusal equilibration: the modification of the occlusal form of the teeth with the intent of equalizing occlusal stress, producing simultaneous occlusal contacts or harmonizing cuspal relations." <The glossary of prosthodontic terms>

The next-to-last procedure to be accomplished at the delivery appointment is refining (equilibrating) the articulation (occlusion). This entails recording centric relation with wax check bites, remounting the mandibular cast and, with the dentures on the mounted remount casts, correcting occlusal discrepancies in centric relation and excursive movements on the articulator.

Armamentarium:

Waterbath at 140 degree Fahrenheit

Bunsen burner or Microtorch

Bard-Parker knife with #25 blade

Articulating film or very thin articulating paper

Laboratory handpiece with #8 and #6 straight handpiece burs

Burlew rubber polishing wheels and SHP mandrel Prophylaxis brushes and prophylaxis contra angle Rag wheels for laboratory lathe

Pumice (powder or fine)

(1) Heat the end of a sheet of dry Aluwax over a Bunsen burner or micro torch flame and prepare two double-thick checkbite strips, 1/2 inch-wide and 1 1/2 inch-long to cover the maxillary posterior teeth.

(2) Dry the maxillary denture and adapt the softened wax checkbite strips over the posterior teeth on each side, using finger pressure to make certain the wax is firmly adherent to the occlusal, lingual and buccal surfaces of the teeth.

(3) Immerse the Aluwax-covered portion of the maxillary denture in the waterbath for 5-10 seconds. This will thoroughly soften the wax.

(4) You should be comfortably seated on your operating stool facing the patient who is also comfortably seated in an upright position. Seat the mandibular denture in the patient's mouth.

PRACTICE PEARL: If the mandibular denture does not have positive retention in the mouth at this time, you must stabilize the denture in place in the mouth by holding it down with the index fingers of your right and left hands on the buccal borders or flanges of the denture in the 2nd premolar-1st molar area. Place your thumbs under the patient's mandible. (Your preferred seating position may be behind and to one side of the patient's head. Many dentists are more comfortable in this position and the finger positions are thus reversed: both thumbs on the buccal flanges or buccal borders in the premolar-molar area and the index fingers under the mandible.) An alternative to holding the denture in place manually may be achieved by using denture adhesive at this time.

(5) With the dentures in place guide the patient to partial closure of the mandible two or three times in the retruded centric relation position. The mandibular posterior teeth should penetrate into the Aluwax but NOT all the way through the wax. (There should not be any tooth-to-tooth contacts).

(6) Chill the wax in the mouth with the air-water spray from the unit air-water syringe.

(7) Remove the maxillary denture from the mouth, thoroughly chill the wax in iced or cold water. Re-seat the denture in the mouth and guide the patient to centric closure. The mandibular denture teeth should seat precisely into the indentations of the maxillary wax checkbites. If there is any doubt that they do, you must strip the wax from the denture and repeat the wax checkbite recording of mandibular closure in retruded position until the mandibular denture teeth seat precisely into previously recorded indentations of the chilled wax checkbite.

(8) When consistent retruded mandibular closure into Aluwax checkbites has been achieved, remove both dentures from the mouth. Seat both dentures on their respective remount casts. Firmly seal the dentures to the casts with sticky wax in three or four locations along the peripheries.

(9) Connect the complex of maxillary mounting, casts, dentures and checkbite, to each other with tongue blade or mounting stick and sticky wax attached to the sides of the bases of the casts.

(10) Attach the assembled dentures and casts to the upper bow of the articulator and an empty mounting plate to the mandibular bow. Adjust the height of the incisal guide pin to compensate for the thickness of the wax checkbite. Lower the pin 2mm (2 rings above the heavy zero ring on the pin).

(11) Invert the instrument and attach the mandibular cast to the articulator with mounting stone.

After the mounting stone is well set, remove the side mounting sticks and sticky wax, open the articulator and remove the wax checkbites.

(12) This centric mounting should be verified by repeat the centric relation registration once again. Place the new registration on the mounted denture to test the “repeatability”.

(13) Loosen the incisal guide pin, then close the articulator to the first occlusal contact, adjusting the height of the incisal guide pin until it contacts the incisal guide table. Then raise the incisal guide pin until the tip of the pin is 0.5 mm above the surface of the guide table. This will limit the closure of the occlusal vertical dimension to 0.5 mm. after occlusal equilibration. There will be at least one pair of occlusal contacts of the denture teeth. Keep the centric locks of the articulator closed. (The condylar guidance angles are those established with the protrusive wax checkbite during the try-in appointment.) Use the thinnest articulating film for refining the occlusion. Place a strip of the articulation film simultaneously on the mandibular occlusal surfaces and incisal edges of each side. Holding the instrument with both hands, open and close the instrument lightly and rapidly several times with a tapping motion, keeping the articulating film between the maxillary and mandibular articulating tooth surfaces.

Observe the contact spot markings on the teeth left by the articulating film. Our object is to achieve as many simultaneous marks as possible in the centric relation of the mandible. We assume at the beginning of the occlusal refinement that the heaviest (largest and darkest) markings are occlusal prematurities. Carefully reduce them with a number 6 or number 8 straight handpiece bur in the laboratory or slow speed handpiece.

Repeat the articulator closures just once or twice to reduce only the grossest occlusal prematurities.

Note that each occlusal prematurity mark left on a mandibular tooth by the articulating paper has its counterpart on an opposing maxillary tooth. We must judge which of each

corresponding pair of occlusal prematurities to reduce. Our goal is to eliminate occlusal prematurities without reducing the occlusal vertical dimension.

Again tap the articulator closed several times with articulating film correctly placed. Open the centric locks and move the upper bow of the instrument to right lateral excursion by moving the upper bow to the left. On the right side, (the working side) reduce prematurities only on the buccal cusps of the maxillary teeth and the lingual cusps of the mandibular prematurities, such as on the lingual (palatal) cusps of the maxillary or the buccal of the lower will have opposing prematurities in occlusal fossae and these should be reduced.

On the left side (the balancing side in right lateral excursion) reduce only the prematurities on the lingual cusps of the maxillary and the buccal cusps of the mandibular. For other prematurities on the left side (buccal cusps of the maxillary, lingual of the mandibular), reduce the corresponding areas on the opposing teeth.

Repeat the procedure and tap to centric closure, then move the articulator to left lateral excursion. Now the left side is the working side and the right is the balancing. Reduce the prematurities appropriately.

PRACTICE PEARL: After each articulator closure and reduction of the appropriate occlusal prematurity of each pair of prematurities, clean all the remaining occlusal markings from the teeth. This will help avoid a confusing multiplicity of occlusal marks and promote precision of the occlusal refinement process. An effective cleaning "instrument" is a cotton-tipped applicator or cotton roll moistened with alcohol.

You should now have achieved the maximum number of occlusal contacts in centric relation position without loss of O.V.D. beyond the 0.5 mm to which you have previously raised the incisal guide pin above the incisal guide table. Now, correct for occlusal prematurities in right and left lateral excursions, all the while conforming to the **BULL rule on the working side (buccal of the upper, lingual of the lower)** and the **LUBL rule on the BALANCING side**.

Finally, correct any remaining prematurities in protrusive excursion. There is no easy rule that applies in protrusive corrections except that we must attempt to preserve as many as possible of those contacts that maintain the O.V.D.

The teeth should have been accurately placed, balanced and corrected during the laboratory phases and during the try-in appointment. At that time, the centric relation was verified and corrected if necessary by remounting the mandibular cast. The O.V.D. was validated and the protrusive record made for setting the condylar guidance. The current process should constitute merely a refinement of the occlusion following processing, utilizing the completed dentures in their most stable form.

(13) When occlusal adjustments are complete, lightly polish the adjusted occlusal surfaces with a slurry of flour of pumice on a propylaxis cup or brush, using a propylaxis contra angle on the slow speed handpiece. Any border areas of the dentures or other polished surfaces which have been relieved by grinding are polished in the laboratory using a sterilized WET rag wheel and fine or powdered pumice slurry on the laboratory lathe ROTATING AT SLOW SPEED (1500RPM) and applying only slight pressure against the denture.

Finally, a high polish is developed on all adjusted occlusal and polished denture surfaces with a dry, clean, sterilized rag wheel and high-polish medium. Again, use SLOW lathe speed and light pressure. Clean the dentures with liquid soap and cool water. Disinfect the dentures for 10 minutes after returning them to the operatory. Rinse with cool water and allow the patient to insert them in his mouth.

E. Refining (Equilibrating) the Monoplane-Zero Degree Teeth neutrocentric arrangement)

The procedures for refining the occlusion of non-balanced articulation of mono plane, zero degree teeth are much the same as they are for anatomical occlusion. The first 10 steps are identical.

1. After the mandibular cast is re-mounted with the use of the centric wax checkbites, the initial articulator tapping closures are made with articulating film or very thin articulating paper. Observe the contact spot markings left by the articulating film on the occlusal surfaces.

Now, the occlusal refinement process begins to differ considerably from that used in equilibrating anatomical teeth.

We do not equilibrate monoplane (zero degree) teeth by selectively reducing with a round bur such as a no. 6 or 8 the small areas of premature occlusion disclosed by the articulating film. To do so would be to create small depressions in what otherwise is a flat, planar (monoplane) surface. Since the goal of monoplane occlusion is to direct all

masticatory functional forces toward the ridges perpendicular to the occlusal plane without cuspal inclinations, We will make all corrections of occlusal prematurities with a large, straight-sided rotating instrument (acrylic resin trimming bur in a laboratory or slow speed handpiece or a flat-ended cylindrical or tapered diamond stone in a high speed handpiece). The stone or bur is gently swept across the entire occlusal surface of the tooth we are equilibrating in order (1) to eliminate the prematurity and (2) to preserve the monoplanar occlusal surface.

It is almost always possible to make all occlusal corrections of monoplane(non-balanced) denture teeth by adjusting the posterior teeth of only the maxillary or mandibular denture, The actual adjustment is made with a very smooth application of the diamond stone or bur that very lightly shaves the entire occlusal surface of the tooth with one sweep. The process of closing and tapping the teeth on articulating paper is repeated until there are multiple contacts on both sides of the arch.

2. If prematurities of the anterior teeth develop during the equilibration, attempt to reduce them in the same arch where you are making adjustments of the posterior teeth. The adjustments will for the most part be minor, but if you feel the esthetics of the incisors are being affected, adjust the anterior teeth of the denture where the changes will be least visible.

3. When polishing the dentures before final insertion, don't use a prophylaxis brush or cup for the initial buffing. Rather use a large, thoroughly water- saturated rag wheel on the laboratory lathe rotating at slow (1500 RPM) speed, a sloppy slurry of fine or powdered pumice and very light pressure. Move the occlusal surfaces of the denture in very light, sweeping motions forward and backward along the periphery of the rag wheel. This will help to assure planar occlusal surfaces of the posterior teeth.

Accomplish the final polish of the adjusted areas of the border, polished surfaces of the dentures and occlusal surfaces of the teeth with high-shine polishing compound on a dry rag wheel on the laboratory lathe. Use low speed and light pressure. Clean the dentures with soap and cool water.

Disinfect the dentures for 10 minutes after returning them to the operatory, rinse with cool water and allow the patient to insert them.

F. INSTRUCTIONS TO THE PATIENT

The last procedure in the delivery of the dentures is providing instruction for the patient. Your oral instructions to the patient should be informative but not overwhelmingly detailed. Providing a set of printed instructions is a good way of conveying detailed directions.

1. Eating and speech: Patients will adapt to new dentures in different and very individual ways. Most will feel awkward speaking and eating at first. By explaining this at the beginning of the new denture experience, you help ease the transition. Encourage the patient to attempt eating "easy" foods at first: eggs, soups, gelatin, and other foods not requiring heavy duty mastication or incising. Eating sandwiches and "hand fruit" like apples and pears should be attempted only after a considerable confidence level is reached with the new dentures. Speech awkwardness is often more subjective in the patient's perception than real and you should encourage the patient to speak or read aloud in private. Your clinical wisdom will be greatly appreciated by the patient if you notify, instruct and encourage him in advance.

2. Resting the mouth. Make sure the patient understands the importance of giving the oral soft tissues resting time each day. Many patients, especially some experienced denture wearers, are accustomed to wearing their dentures day and night, removing them periodically only to clean them. Some patients in fact, describe an inability to sleep without their dentures while a few others decline or refuse to remove their dentures during sleep for personal-social reasons. Obviously, coercion of a determined 24-hour-a-day denture wearer to be otherwise is not possible. The best you can do is to explain why **dentures should be out of the mouth for 8 or more hours each day** and urge the sleep-wearer of dentures to attempt leaving the dentures out for some period each day when privacy or social circumstances permit. Although not borne out by specific long range longitudinal population studies, we, as a profession, consider continuous wear of removable oral appliances, a contributing factor in excessive residual alveolar ridge resorption. Furthermore, studies and clinical experience have shown repeatedly the relation of mucosal inflammatory lesions and yeast infections to continuous denture wear.

3. Cleaning the dentures: instruct the patient about the importance and methods you prefer for cleaning the dentures. The patient should use a denture brush for mechanically **cleaning all denture surfaces with soap and water**. Suggest or provide the patient with a list of effective commercial denture cleaners available at the drug store (the over-night soak is preferable to a denture "cream".)

4. Calculus: some individuals form calculus rapidly on their natural teeth.

These same patients have a tendency to form calculus deposits on their dentures. Good advice: immerse the dentures in ordinary kitchen vinegar one or two nights per month and brush away the softened, partially dissolved calculus in the morning, before rinsing and wearing them.

5. Post insertion appointments. The first recall appointment can be as little as 24 hours away but not more than 48. The 48 hour interval is preferable because it better allows areas of pressure and impingement to manifest themselves. They can then be corrected at the first post-insertion visit before more serious and painful sequelae develop. The second post-delivery appointment is two to four days following the first, depending on the number and seriousness of the complaints requiring treatment. Subsequent appointments are made at generally increasing intervals until the last appointment in this initial series is one that presents no complaints or clinical evidence of functional or tissue difficulties.

PRACTICE PEARL: The number of post-operative appointments following initial delivery of a removable prosthodontic appliance should be one more than patient or dentist finds necessary.

Following the final appointment in this initial series, the patient is told to contact the dentist for appointments if required and is placed on a periodic recall schedule of six to twelve months.

SAMPLE DENTURE CARE INSTRUCTIONS

INITIAL SENSATIONS

When you first begin to wear your dentures, they may feel loose. Until you have learned to keep them in place with the muscles of your cheeks and tongue, they may tip when you chew, allowing food or liquids to pass under them.

No matter how thin the dentures are, they will feel bulky. They may make your tongue feel crowded or may cause a slight gagging sensation. Until your gum ridges are used to supporting dentures, your mouth may feel sore or irritated. Your saliva flow may also increase temporarily.

After a few weeks, as your oral tissues become adjusted to wearing dentures, these problems should decrease. If you continue to experience irritation or excessive soreness in any area, you should see your dentist.

APPEARANCE

When you first get dentures, your facial expression may seem different. A more normal expression will return when the muscles of your cheeks and lips adapt to the dentures.

EATING

When you are first learning to use your dentures, it is best to eat soft foods. Cut your food into small pieces and chew slowly on both sides with your back teeth to keep your dentures from tipping. After a few days, when your dentures are feeling more comfortable try coarser and harder foods until you are able to eat a more normal diet. Learning to chew with dentures takes practice!

SPEAKING

Sometimes, wearing dentures can make a difference in the way you pronounce certain words. To help overcome any speech difficulties, practice reading aloud. If the denture teeth click together when you talk, speak more slowly. Bring any problems to the attention of your dentist.

At first, you may find that your dentures become loose when you laugh, or cough, or even smile. To reposition them, close your teeth together gently and swallow.

WHEN TO WEAR YOUR DENTURES

Follow the dentist's advice on how long you should wear your dentures each day.

Day 1---- _____ hrs

Day 2---- _____ hrs

Day 3---- _____ hrs

Day 4---- _____ hrs

You should always take your dentures out before bed at night, and put them back in the morning. This gives your mouth a chance to rest and helps maintain oral health.

CARING FOR YOUR MOUTH

Even with dentures, you still need to take care of your mouth. Each day before inserting your denture, brush your gums, tongue and palate with a soft-bristled brush, to remove plaque and to stimulate circulation. Visit your dentist regularly (even if you no longer have any natural teeth) for a complete oral examination. Besides checking your dentures, the dentist will screen for signs of oral cancer, and examine your gum ridges, tongue, palate and jaw joints (TMJ).

CARING FOR YOUR DENTURE

For a healthy mouth and fresh breath, clean plaque and food deposits from your dentures daily. This also helps keep the dentures from becoming permanently stained.

Dentures should be handled carefully! Dropping them (even a few inches into the sink) can break the denture base or a tooth. When cleaning or inserting your dentures, hold them over a towel or basin half-filled with water. And always keep your dentures out to the reach of children and pets.

Before brushing your dentures, rinse them well to remove any loose particles. Next, apply your favorite denture cleaner to a moistened brush and clean all surfaces of the dentures. Brush thoroughly but carefully. Scrubbing too hard can damage the plastic parts of the denture or bend metal clasps.

Many special denture-cleaning agents are available (ask your dentist about them), follow their instructions carefully. Some people prefer to use hand soap, a mild dishwashing liquid or baking soda. Household cleaners and some toothpastes should not be used because they are too abrasive. Never use bleach on your dentures!

If your dentures become dry, they may change shape. When you take your dentures out at night, place them in a container of denture-cleaning solution or water. Never put dentures in hot water, they can warp. If your dentures break, crack or chip, or if a denture tooth becomes loose, call your dentist immediately. We can usually repair your dentures, but try to save the broken pieces.

LONG TERM DENTURE SUCCESS

Although your dentures (if cared for properly) will keep their shape, your mouth continues to change. The bone and gum ridges that support your dentures can recede or shrink. If ridge shrinkage occurs, your dentures will begin to feel loose and less stable, and your ability to chew may decrease.

Prolonged use of ill fitting dentures can irritate the gums, tongue and cheeks and cause the ridges of the mouth to shrink to the point where it will be almost impossible to fit them with normal dentures.

To prevent or correct these problems, you should see your dentist regularly.

Your success in wearing dentures depends on you! With a positive attitude, persistence and regular check-ups, you can become one of the millions of people who wear dentures successfully.

CHAPTER 28
Clinical visit #4
POST-INSERTION TREATMENT

A. DEFINITION:

Post-insertion treatment is that phase of the complete denture procedure which concerns itself with any necessary alteration of the dentures, tissue treatment and patient education.

B. PURPOSE:

To permit the patient to achieve maximum oral function without irritation to the oral tissues and further teach the patient how to successfully master his dentures.

C. INSTRUMENTS AND MATERIALS:

1. Mouth mirror
2. Articulating paper
3. Check bite wax
4. Grinding stones and acrylic burs
5. Polishing equipment

D. PROCEDURE

Ideally, the first post-insertion visits should be approximately 24 hours after insertion of the dentures. In this situation, the patient is instructed not to remove the dentures during this period. Because of the clinic schedule, this may not always be possible. If the patient cannot be seen for several days after the first insertion, he should be instructed to remove the dentures if there is any severe discomfort. However, he should reinsert the dentures for at least 6-8 hours before the next appointment.

At the first post-insertion appointment, the patient is asked to relate his experience. The operator should then remove the dentures and examine the tissues, especially those areas noted by the patient. Observe for inflamed or ulcerated areas and areas painful to palpation. The following is a list of problems.

PROBLEMS	POSSIBLE CAUSE	TREATMENT
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1. Ulceration and/or inflammation of the underlying tissues	Excessive denture pressure areas.	Use pressure indicating paste Relieve & polish
	Premature occlusal contacts	Use articulating paper Occlusal equilibration
	Overextension of flange	Reduce length & polish
	Imperfection in denture base	Mark with indelible pencil Relieve & polish
	Foreign body under denture	Clean denture and patient education
	Excessive intra-occlusal distance	Adjust occlusion, reset teeth, or remake dentures
	Oral habits and compulsions	Patient education and medical care
	Poor oral hygiene.	Patient education.
	Poor diet and avitaminosis	Nutrition Consult and medical care
	Systemic disease Allergic reactions Endocrine disturbances	Medical consultation
2. Loose denture or one which separates from the supporting structures when not in function.	Inadequate border seal.	Test with green stick. Add to or relinedenture
	Inadequate post dam.	Test with green stick. Add to or relinedenture.
	Overextension of denture flange.	Support denture, tense tissues, reliev reline.
	Excessively thick denture flange.	Reduce and recontour to permit norm function.
	Perforated denture base.	Repair by addition.
3. Unstable denture	Underextension of denture.	Test with green stick. Add to or relinedenture
	Excessively increased vertical dimension	Reduce or reset teeth or remake denture.
	Improper placement of occlusal plane.	Remake denture.

CHAPTER 29

Immediate Dentures

Introduction:

Immediate dentures, whether partial or complete, are oral prostheses placed in the mouth immediately following removal of one or more teeth. Removable immediate interim partial dentures are generally placed after removal of one or more anterior teeth. An immediate denture is an important treatment modality to help a patient transition. Immediate complete dentures are of several kinds:

1. The conventional immediate complete denture conforms to the following treatment plan:

- A. All the remaining posterior teeth of the arch receiving the immediate denture are removed, usually by quadrants but occasionally all at once. If dictated by particular concerns about an emergency situation involving one posterior tooth or a patient's general physical debility, one or two teeth are removed at a time.
- B. The remaining six(usually) anterior teeth are retained for a period of six weeks to three months. During this time, as the residual alveolar ridges are healing, treatment is performed for the opposing arch - assuming that a conventional immediate complete denture is not also planned for that arch. In the opposing arch, indicated teeth are removed, periodontal, endodontic, and restorative treatment are completed, except for final possible fabrication of a removable partial denture.
- C: The conventional immediate denture is then fabricated and placed immediately upon removal of the 6 anterior teeth.

2. The total - odontectomy immediate denture. This approach to immediate denture treatment encompasses removal of all remaining teeth in the arch, posterior and anterior, at one time and placement of the immediate denture. If one or two posterior teeth remain at the treatment planning stage, it may be practical to retain them until placement of the prosthesis, especially if the posterior tooth or teeth are abutments for an existing partial denture and that RPD replacing one or more anterior teeth could not be worn after the loss of those abutments.

In rare instances an immediate denture is placed following removal of a full or nearly full complement of teeth in the arch.

Practice pearl: the more teeth which are removed to place an immediate denture, the less certain the outcome, the more rocky the postoperative course, and the more time you will spend with your patient in post operative care. Full or nearly full arch immediate dentures are best reserved for more experienced general practitioners or prosthodontists.

Advantages of Immediate Dentures:

- Assured duplication of the patient's natural esthetics.
- Ease and reliability of replication of the patient's jaw relations, especially of the vertical dimension of occlusion.
- More comfortable postoperative course, because the denture protects the odontectomy- surgical sites.
- The internal contours of the immediate denture base guide the contours of the healing ridge.
- Generally less postoperative hemorrhage.
- First-time denture patients accommodate more readily to an immediate denture than to a non-immediate (conventional) denture. Even patients with a hyper-active gag reflex adapt more readily to immediate dentures (the reason for this is unknown, but it is a well known clinical observation).

Disadvantages of Immediate Dentures

- Extra cost of relining a durable or replacing an interim immediate denture.
- Absence of opportunity to try in an immediate denture for esthetic evaluation and change prior to completion of the denture.

Impressions for Immediate Denture (In the Clinic)

The prosthodontic literature abounds with a myriad of methods and materials for immediate denture fabrication. Consult your texts and lecture notes for some of them. At Nova we will use the following method MOST OF THE TIME:

1. After the odontectomy sites of the initially removed teeth are fairly well healed (at least six weeks), make preliminary alginate impressions of the arches in stock, disposable plastic impression trays.
 - a. The impression of the immediate denture arch should be somewhat overextended at the peripheries. It must record important landmarks: tuberosities (maxillary), retromolar

pads (mandibular), frena, the full extent of the facial and lingual mandibular vestibules. All remaining teeth should be accurately recorded. As always, the cast should be poured in two stages. Microstone is the recommended cast material.

Preliminary casts are recovered and trimmed (preserving the peripheral border areas), then articulated using necessary maxillomandibular records.

Experienced clinicians adept with alginate impression-making prefer, whenever possible, to make final impressions for immediate dentures with alginate in an un-modified stock impression tray. It is the method I prefer and you should use it yourself.

To determine in advance the efficacy of this method for immediate denture impressions, start with good diagnostic casts of the partially edentulous immediate denture patient. Then on the cast fit a stock tray of the size appropriate to it. The anterior flange of such a tray will (1) provide a 4 to 6 mm space facial to the facial surfaces of the remaining anterior teeth and (2) the borders of the tray posterior to the anterior teeth must be opposite and just occlusal to the vestibular sulci of the edentulous posterior ridges. The tray must not extend facially beyond the vestibular sulci (or lingually beyond the mandibular lingual sulci). Find a stock tray that conforms to the preceding specifications, then, without border molding, apply alginate adhesive to the tray. Proceed with an alginate impression (mixed somewhat more stiffly than usual) as though this tray were a custom tray. Be objective, however, about the "fit" of your stock tray and later about evaluating the recovered impression. This should accurately capture the teeth, the vestibular sulci and all landmarks, including the posterior border area(s) (maxillary tuberosities and vibrating line, mandibular retromolar pads and retromylohyoid spaces).

If there is no stock tray of the appropriate size or if you fail to secure an adequate final impression after several (no more than three) attempts, then you must make and use a custom tray for your final impression.

FINAL IMPRESSION WITH CUSTOM TRAY:

1. Return to your preliminary cast.
2. With a pencil draw a line at the maximum depth of the peripheral borders.
3. Draw a second line 3mm incisal-occlusal to the maximum depth line. Keep 3mm short of all frena. The line marking the posterior border of the maxillary arch should be a straight line across the palate from hamular notch to hamular notch.

4. With baseplate wax, block out tissue undercuts. Apply the wax with a HOT No. 31 spatula.
5. Adapt as a spacer of three (3) layers of baseplate wax over all remaining teeth and 2 layers of wax on tissue surface of the alveolar ridges. The wax should terminate at the 3mm depth line on the facial aspect. On the palatal-lingual the wax should terminate 2.0mm palata or lingual to the gingival margins.
6. Paint model release agent on the cast and wax; adapt blue impression tray TRIAD to the cast. Smoothly cut off all excess TRIAD apical to the 3.0mm line and posterior to the posterior border line.
7. Place the cast and TRIAD in the TRIAD curing unit for 2 minutes.
8. Carefully remove the TRIAD impression tray from the cast, remove any wax adhering to the tissue surface and wipe off any model release agent still on the TRIAD. Paint Air Barrier on all surfaces of the TRIAD and cure in the TRIAD unit, tissue side up, for four minutes more. Add a proper handle if necessary.
9. Brush off any remaining Air Barrier with soap and water. With an acrylic resin trimming bur in the laboratory handpiece, trim and smooth the impression tray border to the 3mm line. The border edge should be square and not knife edged.
10. With a number eight straight handpiece bur in the laboratory hand piece,
11. make ten to twelve evenly spaced holes in the impression tray as an aid to firm retention of the impression in the tray.
12. Disinfect the tray prior to the patient's appointment for final impression.

Patient appointment (Custom Tray)

1. Try the TRIAD impression tray in the patient's mouth and evaluate for border over-extension (manifested by tray impingement on border areas or frena). Seat the tray firmly against the palate (maxillary arch) or the buccal shelves (mandibular) where there was NO spacer wax.
2. Perform border molding using green stick impression compound (see "border molding" in chapter on final impressions). Trim excess border molding material from the inside of the tray with a No. 25 blade in the Bard-Parker knife.
3. Dry the tray with 2x2 inch gauze pads.
4. Apply alginate tray adhesive to the tissue surface of the tray and the green compound border molding.

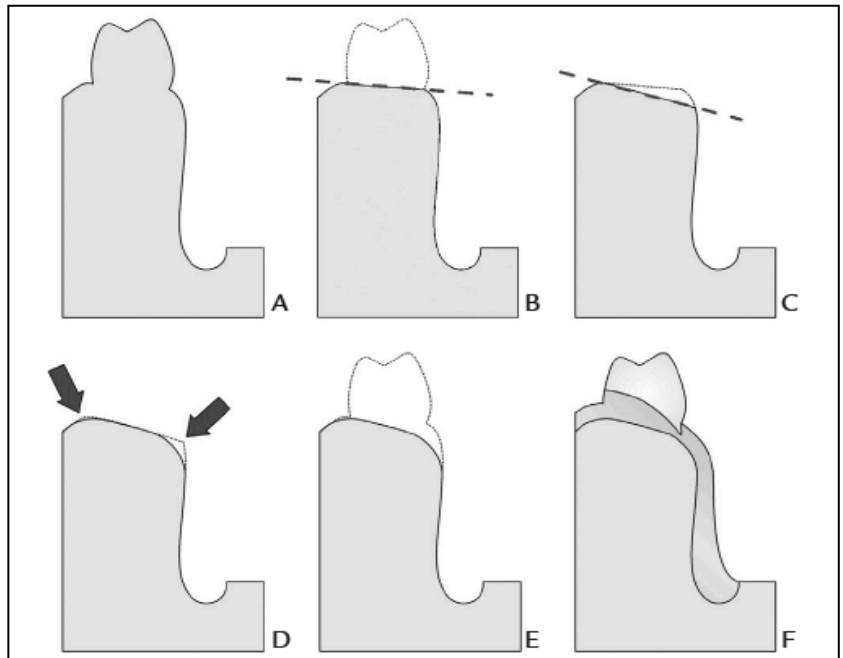
5. Dry the palatal mucoperiosteum with gauze pads. Wet the end of a Dr. Thompson's color transfer stick. Palpate the hamular notches with a mirror, ask the patient to say "HAH" to observe the vibrating line of the palate that delineates the posterior border of the maxillary denture- bearing area and draw that line on the palate with the color stick, from one hamular notch to the other.
6. Make an alginate impression in the tray.
7. Disinfect the impression and dismiss the patient after making his/her next appointment
8. Pour the cast with Microstone. DO NOT BOX AN ALGINATE IMPRESSION. Pour the cast in TWO STAGES. Make sure the lateral surface of the border periphery is covered at least 2 and no more than 3mm occlusal to the periphery.
9. The recovered cast should be trimmed on the cast trimmer so that the land is 4mm wide and the base of the cast is 10-12mm thick. Trim the land with an arbor band so the peripheral border roll is 2mm deep. Be careful not to grind the labial surfaces of the anterior teeth on the cast trimmer.
10. Make an appropriate record base with pink TRIAD, for recording jaw relations.

CAST MODIFICATION OF WHILE ARRANGING TEETH FOR IMMEDIATE DENTURES

Cast modification and toothplacement occurred in 4 distinct phases. In the first phase, a predetermined tooth was removed from the cast by cutting to the gingival margins with a plaster saw (Fig. 1, B). During the second phase, a rotary instrument was used to join the lingual gingival margin to the intermediate line on the facial surface (Fig. 1, C). The third phase involved placement of an artificial tooth in the appropriate position. This procedure was followed for alternating teeth until all artificial teeth were in the desired positions. In the fourth and final phase, the wax base was removed from the cast, and the stone contours were gently rounded with a sharp knife. This modification extended from the line identifying the undercut area to the line identifying the lingual gingival margin (Fig. 1, D). The completed cast modification was intended to provide space for placemenof an artificial tooth, while eliminating the need for aggressive alveoloplasty (Fig. 1, E and F).

Arrangement of the denture teeth should be done one at a time. Utilizing the existing dentition to guide the position of the incisal edges, and tilt of long axis of denture teeth should help duplicating the pre-extraction dental esthetics.

Cut away the stone teeth, one at a time, from alternate sides of the cast, leaving two adjacent teeth to serve as guides for arranging each artificial tooth in the exact position of the natural tooth it will replace. Trim the alveolar ridge anticipating the amount of trimming to be done during surgery. Position each artificial tooth on the cast immediately after cutting away the corresponding stone tooth



and trimming the alveolar ridge. Use the adjacent stone or natural teeth and the axis of the tooth drawn on the cast as guides. After replacing all stone teeth on the cast with artificial teeth, arrange the remaining artificial teeth in balanced occlusion (see previous section on tooth arrangements).

FABRICATING IMMEDIATE DENTURES

All technical procedures for fabricating immediate dentures, with the exception of tooth arrangement, are basically the same as those for fabricating complete dentures.

Because the presence of deep undercuts caused by the remaining natural teeth, and because of the necessity for accurately positioning the soft tissue, the impressions are usually made with elastic impression materials.

Mount the casts and baseplates on the articulator in the usual manner, according to the face-bow record and accurate centric and protrusive relation records obtained from the patient, and use the protrusive relation record to adjust condylar guidance inclination.

When require, alter the artificial teeth by grinding, or characterize them by applying stains and inserting restorations to achieve an exact reproduction of the patient's remaining teeth.

After the teeth have been arranged, all technical procedures are the same as those for fabricating complete dentures. In addition to modifying the posterior seal area, modify the alveolar ridge as required for each patient.

The technical procedures described below must also be performed when surgical templates are required.

FABRICATING SURGICAL TEMPLATES

A surgical template is a thin, transparent acrylic resin base shaped to duplicate the form of the impression surface of an immediate denture. It is used to disclose areas of the alveolar process that must be surgically trimmed before insertion of the immediate denture. In the laboratory prescription, special instruction is given requesting "duplicated casts for surgical templates".

After the wax has been eliminated from the molds for the immediate dentures once you have made all necessary alterations to the casts. The lab technician will make an accurate impression of the cast in the lower half of the flask, and pour a stone cast. It will be returned together with the processed, finished dentures. Use 2 layers of 0.020" thickness Vacuform stent material to form a rigid template. Mark the border of the template 2mm short of the vestibular depth. Trim, finish and polish the template. Place the completed immediate denture and the surgical template in water until they are needed for the surgical procedure.

CHAPTER 30

OTHER DENTURE SERVICES

REPAIRING FRACTURED DENTURES

The basic techniques described in this section may be modified for handling any type repair commonly encountered by the prosthetic technician. In making repairs, the fractured parts must be lined up carefully and accurately in order to maintain the proper relationships in the repaired denture.

Assemble the parts of the broken denture and lute them together with sticky wax on the external surface. While the sticky wax is being added and while it is hardening, the parts must be stabilized. The assemblage may be strengthened with discarded burs or plastic or wooden sticks.

Fill in any deep undercut on the denture prior to pouring a cast in the denture, so that the denture can later be removed to prepare the fracture line. Since self-curing acrylic resin is used to effect repairs, the denture need contact the cast only in the area of the fracture. If undercuts in the denture were reproduced in the cast, the denture would be difficult to remove for preparation of the fracture line. In such a case, the fracture line would have to be widened through to the cast, and the edges prepared without removing the denture from the cast.

Before pouring the cast, make sure that the parts are positioned in correct relation to each other. Then gently vibrate a stone mix onto the denture foundation surface to eliminate air bubbles and prevent their entrapment in the cast. Since a large cast is not needed for repairs, do not invert the denture over a mix of stone but allow the denture to remain upright until the stone sets. Inverting the denture, or applying any pressure to it, increases the danger of parting separating and shifting.

After the stone sets, remove the denture from the cast and remove the sticky wax. To widen the fracture line, cut away the denture base material on both sides adjacent to the fracture line. Roughen, rabbet (a groove or cut made in the edge of a board, etc. in such a way that the other piece may be fitted into it to form a joint), and dovetail the edges to be joined to increase the mechanical retention of the new material. If any broken teeth

are to be replaced, enlarge the sockets on the lingual side to accommodate the new teeth.

Apply either tinfoil substitute to the area of the cast beneath the fracture line and replace the assembled parts on the cast. Self-curing acrylic resin is used for the repair. The denture is not flaked, nor is heat applied, during the processing.

Moisten the surface of the repair area with monomer, sprinkle polymer into the fractures area, and add monomer until the polymer is completely saturated. Use enough acrylic resin to slightly over-contour the repair area to allow for possible shrinkage and to permit finishing after polymerizing is complete.

When the repair area has been built up sufficiently, adapt tinfoil over the moist acrylic resin.

Then place wet ring liner material over the tinfoil to hold it in place during polymerization. Unless the new acrylic resin is covered during the initial stage of polymerization, an excess amount of monomer will be lost through vaporization, and as a result, the cured acrylic resin may be porous.

Allow the acrylic resin to polymerize in an air-pressure pot submerged in warm (not hot) water, under at least 30 pounds of pressure per square inch, for 15 minutes, or longer. Then remove the denture from the cast and polish it in the usual manner.

REPLACING TEETH

The replacement of loosened or broken teeth is relatively simple. Loosened teeth which have not been chipped or broken are simply reattached in their original positions. A stone cast is seldom needed for the simple replacement of teeth on a complete denture.

Cut away the fractured teeth with burs, leaving enough space for the placement of new teeth. Usually the acrylic resin on the facial surface of the denture base need not be disturbed, for the repair can be effected from the lingual aspect. Cut away the acrylic resin on the lingual side to provide sufficient access, and dovetail the area to provide better mechanical retention of the new acrylic resin.

If the original tooth is being replaced, it will go into position easily and accurately. If a new tooth is used, the mold number of the original tooth, which indicates its size and shape, may be obtained from the ridge lap or from the imprint of the tooth in the denture base. If the denture was made here at CUCDM, the mold number should be recorded in the patient chart. If the information you require is not in any of the above places, measure the width and length of the contralateral tooth and/or compare the occlusal form of the contralateral tooth with those from the mold guide and chart. The shade is determined from the adjacent teeth with the aid of a shade guide.

Position the tooth in proper alignment. If the original tooth was altered, either gingivally, proximally or incisally, alter the new tooth similarly to reestablish esthetics and function. Attach the new tooth to the adjacent teeth with sticky wax on the facial surfaces, to keep it in the proper alignment. Add self-curing acrylic resin, allow it to polymerize, and finish the repair in the same manner as for the repair of broken denture.

DENTURE RELINES

The relining of a denture is the resurfacing of its tissue side with new base material. Tissue changes in the denture support area necessitate relining of a denture to make it fit more accurately. An impression is made of the tissue surface of the mouth, using the denture as a tray. The impression material is replaced with acrylic resin to form a new denture foundation.

Preparatory to the start of any type of denture reline procedure the patient should have the opposing arch present (i.e., if the opposing arch is a CD or RPD, the opposing denture must be in place). If a reline of both arches is planned, the least stable denture is relined first.

Remove enough of the periphery of the denture to create 2mm of space for border molded with green stick compound.

After border molding, before impressioning, REMOVE ALL UNDERCUTS IN THE DENTURE WITH AN ACRYLIC BUR.

After the undercuts have been removed, a final impression is made using the denture as impression tray. The patient must be instructed to keep the teeth in occlusion while

muscle molding is being done and the impression material is setting. (Closed mouth impression technique.)

After the impression material has set, remove the denture from the mouth. Bead and box the impression and pour a stone cast. After the stone has set, remove the wax from the cast. **DO NOT SEPARATE THE DENTURE FROM THE CAST!!** Trim the base and sidewalls of the cast and smooth the land areas.

The cast, with the denture still in place, is then sent to the laboratory for the laboratory reline procedures. **(Prompt laboratory pickup and process need to be arranged ahead of time!)**

Flask the denture in the usual way. If the new impression was made with a thermoplastic impression material, place the flask in boiling water for 5 minutes to soften the material before carefully opening the flask. Remove impression material from the cast and from the denture. Roughen and cut back the entire surface of the denture at least 1mm with acrylic burs. Create small undercuts or roughen surface to ensure mechanical retention of the new acrylic resin. Square the denture border, remove all debris from the denture and the flask. Modify the posterior palatal seal area of the maxillary cast.

Coat the surface of the denture with a cotton pellet moistened with monomer. Pack the denture with acrylic resin dough, and trial pack. Repeat trial pack as needed, then close for a final time. Extreme care must be taken to see that the flask is closed completely. Process the denture in the usual manner. During processing, never allow the water to exceed the recommended temperature. After curing, the denture is recovered, finished, and polished as if it were a new denture.

DENTURE REBASING

Rebasing is the process of refitting a denture by replacing most of the denture base material without changing the occlusal relations of the teeth. Dentures may require rebasing because of tissue changes, damage to the denture base, and/or broken teeth. This procedure is similar to the relining procedure. The difference is that all of the old acrylic resin is removed, except just enough to hold the denture teeth together in one U shaped piece, and replace with new acrylic.

CH. 19 ARRANGEMENT OF ZERO DEG POSTERIOR TEETH

Design Features:

- NON-anatomical
- Wider B-L table
- 0 deg cusps—non-interfering + complete freedom in lateral excursions
- resemble WORN natural teeth (from mesiofacial view)
- arranged in BILATERAL BALANCED OCCL or NEUTROCENTRIC OCCL
- arranged w compensating curves OR in flat linear occl
- open occl angles—ideal for lingualized setup w anatomic uppers
- max teeth can be positioned w lingual surfaces set to straight edge provides proper buccal contour for esthetics/fxn

Note: ideal for advanced RIDGE RESORPTION

Arrangement Recommendations:

- max PM + M: long axes at right angle to occl plane + all cusps touch plane (fig. 1 + 2)
- align LINGUAL cusps of all posteriors to straight line (can use trubyte plane) (fig. 3 + 4)
- occlude mand TO max
 - **1.5 mm overjet** (recall we're talking about posteriors) prevents cheek biting
- max + mand teeth are set END-TO-END (do NOT interdigitate)
- **MB cusp** of max 1st M sits on top of **B groove** of 1st mand M (fig. 6)

Articulator settings:

- 30 deg condylar inclination/guidance
- 0 deg Incisal inclination/pin
- 12-15 deg Bennet angle

Note: NO contact in BALANCING side

(CH. 20 DON'T NEED TO KNOW-you are a gem Dr. Hsu)

CH. 21 LINGUALIZED OCCL SCHEME DENTURE TEETH ARRANGEMENT

Intro:

- eliminates tooth contact points on B cusps (fig 1)
 - occl contacts moved as far LINGUAL as practical
- assures seating + minimizes tipping of lower denture during fxn
- defined as “setting the upper posterior teeth in a turned-out position, so that only L cusps of max teeth contact center of occl table of mand posteriors”
- pts w resorbed ridges + restricted neutral zones may determine the extent to which esthetics will be sacrificed for fxn improvements
 - in such cases, lingualized occl MINIMIZES ESTHETIC COMPROMISES + OPTIMIZES FXN

Set-up Technique:

- select HIGHER DEGREE UPPER posteriors + LOWER DEGREE LOWER posteriors
 - o ex. 30 deg max + 0 deg mand
- **1st set uppers** w ideal compensation curves (unless linear arrangement desired)
 - o anteriors: set in physiological position
 - o posteriors:
 - set over resorbed ridge if enough tongue space exists OR...
 - set facial to ridge when esthetics req it
 - o elevate B cusps 2mm by inserting object bw cusps + table when wax still soft (fig 3)
 - cusps now in proper contact bw opposing stamp cusps
 - stamp cusp= working cusp that occludes into fossa of opposing dentition
 - o do NOT grind these stamp cusps!
 - also eliminates contact bw max B + mand B cusps in working mvmt
- **2nd set lowers** starting w **1st M**("key to occl")
 - o use ML max cusp as stamp cusp
- use BULL for adjustments
- **Grind-in Option:** (before setting mand)
 - o open articulator pin 1 mm
 - o grind saucer shape ~2mm wide to accommodate stamp cusps
 - o develop saucers until pin contacts incisal guide table

Arrangement Recommendations:

- max PMs: long axes at right angle to occl plane (fig. 6)
 - o L cusps touch plane (fig 7)
 - o B cusps raised ½ mm
- Max Ms: long axes inclined MESIALLY (fig 6 + 7)
 - o 1st M:
 - ML cusp touches plane
 - DL raised slightly
 - MB raised ½ mm
 - DB raised 1 mm
 - o 2nd M:
 - DL cusp raised 1-1.5 mm
 - DB raised 2 mm
- Occlude central fossa of mand to L cusp of max (fig 8)

CH. 22 CLINICAL VISIT #4: DENTURE TRY-IN

2 Options:

1. **ONE-STEP Process (NSU PROTOCOL!)**: All teeth arranged based on wax rims, jaw relation records, etc. arrangement tried in in visit #4
2. Two-step process:
 - ✓ Anteriors tried in + VD and CR preliminarily verified in visit #4
 - ✓ Definitive try-in in visit #5

Objectives of #4:

- Verify jaw relation records on program articulator
- Eval harmony bw teeth
- Obtain pt acceptance

Visit #4 Protocol:

(before appt, mounted trial dentures eval'd by faculty, disinfected, + rinsed w H₂O)

1. CONFIRM VERTICAL + CENTRAL RELATIONS

- **Check centric relation FIRST**--Faulty CR record causes incorrect mounting and creates need to:
 - o Make new record
 - o Remount mand cast
 - o Rearrange mand posteriors
- Insert wax trial dentures in mouth → instruct pt NOT occlude firmly → Guide pt into CR
- Place 2-3 layers of Aluwax on occl surfaces of max posteriors
- Re-insert dentures + guide into CR
- Check vertical relation of REST + vertical relation of OCCL
 - o Apply phonetics tests
 - teeth should NOT contact during speech
 - 1-2 mm of space bw 1 PMs during sibilant sound production should exist
 - o excessive display of BOTH max + mand should NOT be evident unless deep overbite exists
 - o nose to chin measurement at rest is 2-3 mm > OVD
 - o minor changes (1-2mm) can be made on articulator; large changes req new CR record

2. CONFIRM SELECTION/ARRANGEMENT OF ANTERIOR TEETH

- Verify MIDLINE
 - o Centered to philtrum of upper lip (when pt is smiling)
 - o Mand midline then corresponds to max
 - o Discrepancy = incorrect CR
- Check size/form/shape/arrangement of teeth
 - o Observe from several angles + from a distance
 - o Eval occl plane now
 - o Observe lip support
 - labial flange must be waxed to proper contour
 - max anteriors provide natural lip support
 - o mand anteriors—
 - slightly anterior to ridge crest
 - non-interfering in protrusion (esp first 2-3 mm of mvmt)
 - o crossbite may need to be established if max posteriors too far B
- Phonetics eval--

Sound	Influenced by..	Cause of Problems
Lip sounds: P + B	• Labiolingual position of anteriors • Thickness of labial flanges	Insufficient support by teeth + denture base

Labiodental sounds: F + V (highest part of lower lip barely touches incisal edges of upper teeth)	• Labioling position of upper or lower anteriors • Length of upper anteriors	• Max anteriors too LINGUAL • Occl plane too HIGH • V sounds like F= uppers too short • F sounds like V= uppers too long
Linguodental Sounds: TH	• Thickness of palatal denture base • VDO	• Too much VDO
Linguopalatal Sounds: T + D	• Position of max anteriors • Thickness of palatal denture base	• T sounds like D= teeth too lingual • D sounds like T= teeth too forward or denture too thick
CH + J + S (incisors approach e/o but NOT touch) ("S" produced by air escaping behind max incisors b/w tongue + palate)	• Thickness of denture base lingual to max centrals • VDO	• Lipping= too thick lingual to max centrals • Whistling= deep channel lingual to max centrals • S sound like SH= too broad channel lingual to max centrals

3. CONFIRM ARRANGEMENT OF POSTERIOR TEETH + OCCL PLANE + PROTRUSIVE CHECKBITE RECORD

- Use Fox occl plane (instrument)
- Make wax protrusive maxilliomand record (final step of try-in appt)
 - o Purpose: enables adjustment of condylar guidance controls on articulator to conform to angular paths made by pt in protrusive mvmt
 - Paths are NOT straight
 - Resultants of anatomical bony config + several neuromusc activities (not solely dependent on glenoid fossa/articular eminence)
 - o Technique:
 - Open centric latches on articulator
 - Heat Aluwax ☞ fold into 3-thickness strip 18 mm wide ☞ adapt over occl surfaces of mand posteriors
 - Soften JUST aluwax in 140 deg waterbath
 - Simulate straight protrusion on articulator (move upper bow BACK 6 mm) ☞ close so max posteriors penetrate 1 mm into aluwax
 - Chill wax w air-water spray while art. still closed
 - Place trials in mouth ☞ have pt practice protrusion, closing into aluwax impressions
 - Remove mand denture ☞ reheat aluwax, but preserve max cusp impressions
 - re-seat mand denture ☞ have pt protrude + find cuspal indents
 - observe carefully—tell pt when to stop closing so pt doesn't penetrate wax!
 - Replace dentures on artic ☞ seat max teeth into indents
 - Rotate RIGHT condylar guide until LEFT posteriors settle into precisely into

- indents (repeat on other side) 🟡 lock condylar guides
- Observe indicated angulation of the now calibrated condylar guides + record
- Remove aluwax
- Re-set teeth to new CR

CHECKLIST OF WAX TRIAL DENTURE:

- ✓ CR
- ✓ Midline
- ✓ VDO
- ✓ Lip support/waxed to full contour
- ✓ Teeth arrangement
- ✓ Buccal corridor
- ✓ Occl plane
- ✓ Shade selection (teeth + base acrylic)
- ✓ Phonetics
- ✓ Max posterior extension (posterior palatal seal)
- ✓ Pt approval!!!

NOW YOU CAN SEND TRIALS TO BE PROCESSED ☐

CH. 23 OCCL CONSIDERATION FOR EDENT PT

TERMINOLOGY:

Long axis: Longitudinal line where crown is most symmetrically distributed

Inclination: deviation from long axis (from vert axis of reference)—4 kinds: facial, ling, mesial, distal
Ex. Mesial incline when INCISAL/OCCL end is more toward midline

MICP: centered, contact position of occl surfaces bw both arches

Excursion: mand mvmt that has CO as starting point

Working Side: side to which mand moves in lateral excursion

Working Occl: contact relationships on working side

Balancing Side: side opposite working side

Balancing Occl: contact relationships on balancing side

Protrusion: mand thrust forward

Eccentric Occl: mand position where teeth contact in other than CO

Horizontal/Vertical Overlap: when are in teeth in CO

Compensating Curve: combo of anteroposterior (Spee) + lateral (Wilson) curves

Objectives of arranging teeth:

- ✓ Max chewing fxn/stability
- ✓ Avoid interference w speech
- ✓ Natural appearance

Goals of Occl:

- ✓ Minimize trauma
- ✓ Enhance stability
- ✓ Esthetics
- ✓ Facilitate speech
- ✓ Restore mastication efficiency

BILATERALLY BALANCED OCCL (selected for our typodont pt)

Provides bilateral, simultaneous, anterior/posterior occl contact in centric + eccentric positions

Provides fxn/esthetics while minimizing denture base tipping (lateral) forces

Features:

- Anteriors have 1-2 mm overjet + .5-1 mm overbite
- A-P(Spee) compensating curve via gradually elevated LINGUAL cusps
- M-L(Wilson) compensating curve via gradually elevated BUCCAL cusps
- Constant occl contacts during excursive mvmt—help stabilize denture bases
- Use ANATOMICAL denture teeth

ADV of anatomical teeth	DISADV of anatomical teeth
✓ Tooth-2-tooth + cusp-2-cusp occl possible ✓ Definite point of (+) intercuspation ✓ Esthetically similar to natural teeth ✓ Greater chewing capacity ✓ Excessive chewing pressure minimized ✓ Shearing ability even after wear	▪ Difficult/time consuming (steeper cusp angle= harder to get balanced occl) ▪ Settling results in damaging interferences ▪ More lateral stress ▪ Balanced occl lost w denture base settling ▪ Req frequent follow-ups + relines

MONOPLANE OCCL (i.e. zero deg teeth)

1. **NEUTROCENTRIC** (Nova protocol!)

- A-P occl plane(teeth) is parallel to denture base—completely flat!
 - o NO compensating curves
 - o No inclination of teeth
- Not dictated by condylar inclination
- NO overbite
- Pt instructed NOT to incise bolus—**CHOP** (not chew/grind)
- Horizontal + lateral condylar guidance = 0
 - o Artic used as hinge artic, just for opening/closing mvmt
- Use NON-anatomic teeth

ADV of NON-anatomic teeth	DISADV of NON-anatomic teeth
✓ Less horizontal forces ✓ CR is area instead of point ✓ Freedom of mvmt ✓ Solid occl ✓ Adaptable to situations prone to denture base shifting ✓ Easy to set/adjust ✓ Best for pt w poor musc control + poor ridge relationships	▪ NO vert component to aid in shearing ▪ Occl adjustments impair efficiency unless spillways/cutting edges restored ▪ NO (+) intercuspation ▪ Esthetically limited

2. BALANCED OCCL (not used at Nova)

- 2 techniques to achieve this:
 - o *Balancing Ramp*
 - Tipping mand 2nd molars creates A-P curve OR..
 - Using wax to create 30 deg ramp distal to 2nd M
 - o *Incorporate Compensating Curves*
 - Set 3 teeth maximum on each side
 - 1-2 mm overjet
 - A-P (Spee) Curve- from canine to retromolar pad
 - 1st M:
 - o M cusps level w occl plane
 - o D cusps elevated
 - 2nd M:
 - o D cusps above retromolar pad
 - 20 deg maximum extent of curve
 - M-L (Wilson) Curve—raise B cusps
- Lingualized Occl is another subtype (see ch. 21 notes for details)

Let's Compare...

	BILATERAL BALANCE (anatomical)	NEUTROCENTRIC (non-anatomical)	LINGUALIZED (mixed)
Esthetics	✓		✓
Cuts food easily	✓		✓
Stable during excursions	✓		✓
Simpler technique/less precise record		✓	✓
Less lateral forces		✓	✓
Easy to adjust		✓	✓

Good for Class II + III jaws relations		✓	✓
Good Stability/ forces centralized		✓	✓

CH. 24 COMPELTE DENTURE WAX-UP + FESTOONING

Wax-up Features:

- Palate of max denture is even in thinness (w or w/o rugae)
- Must be self-cleaning
- Papilla either smooth or convex
- Mand lingual flange= slightly concave
- Appears natural
- No grooves
- Stippled so light deflects off denture
- Must replace lost bony structure
 - o Canine eminence
 - o Gingival bulge on buccal
- Base uniform in thickness
- Waxed exactly as how you want final denture to appear
- Posterior palatal seal in place

FESTOONING PROCEDURE:

MAXILLARY FESTOONING—

- Palate of baseplate removed +replaced w 2-thick baseplate wax
- Remove palate (don't recall doing this???) Use die saw + cut as close to lingual surfaces of teeth as possible
- Add wax to palate—extend to posterior border of posterior palatal seal
- Carve palatal surface carve BELOW horizontal palatal plane
- Contour wax, etc, etc, etc

MANDIBULAR FESTOONING—

- Lingual ging margins=
 - o 20 below horizontal on posteriors
 - o 45 on anteriors
 - o posterior ling flanges slope toward tongue + not convex
 - o distolingual flange area blends into retromylohyoid space

Seal max/mand dentures to cast—add line of wax around entire periphery

CH. 25 REMOUNT INDEX

Final occl corrections

- done at denture delivery appt
- AFTER initial fitting + prelim border/tiss surface adjustments
- NOT intraoral procedure
- Done after dentures are re-mounted

Max denture must remain in proper position—achieved by:

- Making new **facebow record**/transfer to mount on new remount cast OR..
- Preserving original position as last step before waxed dentures are processed
 - o Must record incisal edges + occl surfaces of waxed up max denture

Procedure:

- Complete final waxups of dentures
- Remove mand denture/cast from articulator → place new mounting plate
- Wrap boxing wax around mand mounting plate to form chimney
 - o As high as (but not higher) incisal edges of maxillary anteriors
- Fill chimney w **plaster** → close artic so only **incisal edges + cusp tips** ^{maxillary} penetrate plaster
- Keep this occl remounting index to use right before delivery appt

Note: alternative technique to above= remount jig method (benefit is plaster index can be separated from jig + preserved for remount procedure while jig is used for other cases)

CH. 26 PROCESSING + FINISHING

Substitution of baseplate material/wax for ACRYLIC RESIN

PROCEDURE:

1. FLASKING

- Placing waxed denture in investing media in preparation for wax elimination + acrylic resin packing
- Investment materials = PLASTER + STONE (due to hardness + ability to reproduce surface detail)
- Vasoline all exposed surfaces
- Denture 1st invested in lower half of flask (place cast in plaster)
 - o Plaster flush w land area
 - o ½ inch clearance req from top of flask to teeth (up to
 - o plaster sets in 20 min
- this is where I get confused and can't put together what Hsu is saying
- blah blah blah
- place flask in a press under light pressure
- artificial stone used over teeth bc stronger, so will resist pressures against teeth during packing stage
- stone sets in 45 min

2. WAX ELIMINATION

- immerse flask in boiling H₂O for 5 min
- pry open flask—wax now eliminated

3. PACKING

- allow flask to cool to RT
- paint all surfaces w tin foil substitute EXCEPT TEETH
- mix acrylic resin to DOUGHY stage
- Trial Pack Closure Method:
 - o Acrylic placed in flask halves is excess
 - o Flask compressed → pressure raised to 1500 psi → increases 1000 psi each cycle until complete closure achieved (2-3 cycles usually)
 - o SO, packing pressure= moderate + gradual

4. CURING

- Bench Curing= flasks remain under pressure for 15 min
 - o Allows acrylic to equalize its flow before curing
 - o Long Cure:
 - 160 deg H₂O
 - leave flask in tank for 8-10 hrs
 - remove from tank + bench cool flask
 - o Short Cure:
 - 160 deg H₂O for 1.5 hrs
 - boiling H₂O for 1 hr
 - remove flasks + bench cool

5. RECOVERY (DEFLASKING)

- remove flask lid w mallet + wedge
- remove all plaster in small increments
- now you have a processed denture base w teeth attached to a stone master cast

6. OCCL CORRECTION (aka LAB REMOUNT)

- recovered dentures luted to original mountings on artic
- check occl
 - o common fault= increased vert dimension (incisal pin will be open)
 - error < 3/4 mm is correctable via selective grinding

7. FINISHING

- denture removed from stone casts
- trim gross excess acrylic down to original waxed denture form
 - o careful not to trim: B/F/L fold contours, post dam area, ging festooning, surface contour, root eminences
- remove small blebs from tiss side (otherwise leave totally untouched)
- finish external surfaces w rubber wheels
- polish w wet rag wheel + pumic on LOW speed lathe
- shine w felt wheel + green compd

CH. 27 CLINICAL VISIT #5: INSERTION + OCCL EVALUATION

Objectives:

- Intraoral placing of dental prosthesis + eval of occl using remount procedure
- Test retention/stability
- Have pt wear denture home!

PROCEDURE:

PRE-DELIVERY (lab) correct occl discrepancies during remount process

PRE-DELIVERY (office):

- Exam dentures—palpate tiss surface correct any rough areas/nodules w acrylic burs
- Make remount casts
 - Dentures should be easy to place/remove from casts
 - Casts will hold dentures during final occl refinements
 - Procedure—
 - Fill undercuts w wet tiss paper
 - Place plaster inside denture base invert dentures into a mound of plaster
 - Plaster should engage/overlap entire length of denture borders by 2 mm
 - After plaster set, trim cast: 2-4 mm land area + 10 mm thick base
- Remount Max Cast
 - Attach plaster remounting occl index (made before dentures sent out for processing)
 - Seat incisal edges of max denture into index mount max cast

DELIVERY APPT

- **Instruct pt to leave OUT old dentures** for as long as possible (overnight at least)
 - Morning appt ideal for this
 - If pt refuses, have them sit privately in operatory an hour prior to appt
 - Same idea goes for making final impression
 - This allows loss of tactile memory to develop (minimizes comparisons on strange feeling new dentures vs comfy old ones)
- **Initial seating of dentures—**
 - PIP applied to tiss surface + border areas
 - Seat denture, but do NOT force it
 - Areas resisting seating will wipe away PIP relieve these impingement areas w acrylic bur reapply PIP
 - Have pt close, but NOT to occl contact for 30-60 s (cotton rolls bw molars) inspect

PIP again

- o Do NOT relieve post-palatal seal areas at this appt unless pt complains of pain
 - This area SHOULD denude PIP
- o Pat attn to frenums, esp LABIAL Frenum bc most active during fxn
- **Check border thickness—**
 - o If pts upper lip looks overly full...
 - May resolve itself once perioral musc relaxes to new dents
 - If not, max anterior border thinned out at next appts
- **Pt perception—**
 - o Give pt mirror to check themselves out—oo so gratifying
 - o Pt expects excellent retention, but may be disappointed
 - Reassure pt that retention will improve as their lips/tongue/cheeks/reflexes adapt to new dent
 - In extreme cases, suggest denture adhesive during “learning” phase
- **Refining/equilibrating articulation**
 - o Goal= equalize occl stresses
 - o Involves CR check bites, remounting mand cast, correcting occl discrepancies in CR/excursions
 - o Procedure for ANATOMICAL/SEMIANATOMICAL teeth—
 - Covered max posteriors w 2-thick aluwax
 - Immerse wax-covered portions in 140 deg waterbath for 5-10 s
 - Seat mand dent in pt mouth
 - Note: if mand dent does not has (+) retention ☹hold down w index fingers on buccal borders/flanges in 2nd PM/1st M area + thumbs under mand (alternative= adhesive)
 - Guide pt to partial closure a few times in retruded CR position
 - Mand posteriors penetrate into wax but do NOT go all way thru
 - Chill wax in mouth w air-water syringe
 - Guide pt to centric closure again ☹mand teeth in indents on max checkbite
 - Place both dents on remount casts ☹mount on artic
 - Close artic to 1st occl contact ☹adjust ht of incisal pin until it contacts table ☹raise pin .5 mm above table (limits closure of vert dimension!)
 - Use articulating film to adjust occl
 - Goal= get as many simultaneous marks as possible in CR
 - Assume heaviest marking are occl prematurities ☹reduce while maintaining vert dimension
 - Repeat as needed (clean off occl markings everytime)
 - Repeat for excursions:
 - BULL on working side
 - LUBL on balancing side
 - Polish surfaces w SLOW lathe
 - Clean w soap/H₂O ☹disinfect for 10 m ☹rinse w cool H₂O
 - o Procedure for MONOPLANE-ZERO DEG teeth:
 - Mostly same as above...
 - Do NOT equilibrate teeth by selecting reducing (will create depressions)
 - All corrections of occl prematurities w large, straight-sided rotating instrum ☹gently swipe across ENTIRE occl surface
 - Usually ok to make all corrections on just POSTERIORES of ONLY max or mand

- If premies develop on anteriors → adjust in same arch as posterior reductions were made in
 - Polish w water-saturated rag wheel (NOT prophyl brush/cup)
- **PT Instructions:**
 - Initially may feel loose/bulky/sore → will resolve
 - Saliva flow will increase temporarily
 - Facial expression may seem diff → normalizes after muscles adapt
 - Eat “easy” foods initially + chew slowly on both sides
 - Sandwiches + hand fruits only after very confident
 - talk aloud in private
 - if clicking → talk slower
 - initially may come loose when laugh/cough/smile → close teeth together + swallow
 - give oral soft tiss resting time everyday—8 hrs at least
 - continuous wear → residual ridge resorption + inflmm lesions + yeast infxns
 - place in H₂O or denture-cleaning soln overnight (NOT in hot water!)
 - dry/hot dentures will warp
 - brush gums/tongue/palate daily before reinserting
 - clean mechanically using denture brush w soap/H₂O daily
 - do so over towel or filled sink to avoid dropping/breaking dent
 - do NOT use household cleaners or toothpastes (too abrasive)
 - NEVER BLEACH
 - overnight soak better than cream
 - if calculus buildup → immerse in kitchen vinegar couple times a month, then brush away softened calc in morning
 - recall appts:
 - 1st recall appt: 24-48 hrs later
 - allows areas of pressure to manifest
 - 2nd recall appt: 2-4 days after 1st
 - last appt: one that presents w no complaints or one more than pt/dentist find needed
 - periodic recall: 6-12 months
 - if ridge shrinks, dentures will feel loose → irritates oral cavity → see dentist regularly!

CH. 28 CLINICAL VISIT #6: POST-INSERTION TX

Goal= Alterations, tiss tx + pt education → achieve max oral fxn w/o irritation!

Procedure:

- instruct pt to NOT REMOVE dentures ~24 hrs after initial insertion, ie until the 1st recall appt
 - if pt can't be seen for a few days, have them insert 6-8 hrs prior to appt
- check for PROBLEMS...
-

ULCERATION + INFLMM OF UNDERLYING TISS

CAUSES	Tx
excessive pressure	Use PIP → relieve pressure

premature occl contacts	Occl equilibration
Overextended flange	Reduce length
Imperfection in denture base	Relieve
Foreign body under denture	Clean + OHI
Excess intra-occl distance	Adjust occl or reset teeth or remake dentures
Oral habits/compulsions	Pt education
Poor diet	Nutrtn consult
Systemic dz/allergy/endocrine issue	Med consult

LOOSE/SEPARATES FROM SUPPORTING STRUCTURE WHEN NOT IN FXN

CAUSES	Tx
inadequate border seal/ post dam	Test w green stick → add to or reline
Overextended denture flange	Relieve or reline
Too thick denture flange	Reduce/recontour
Perforated denture base	Repair by addition

UNSTABLE DENTURE

CAUSES	Tx
Underextended denture	Test w green stick → add to or reline
Excessive vert dimension	Reduce or reset teeth or remake
Improper placement of occl plane	Remake denture (fuck)

CH. 29 IMMEDIATE DENTURES

Placed in mouth immediately after extraction of 1+ teeth to help pt transition

Conventional Immediate Complete Denture

- all remaining POSTERIORES of arch that's getting immed denture are REMOVED
- remaining 6 ANTERIORES are RETAINED for 6 wks-3 mo
- in meantime, residual ridges are healing + any req tx performed on opposite arch
- immed dent placed upon removal of 6 anteriors

Total-odontectomy immediate denture

- ALL remaining teeth in are removed at once
- s/t it's practical to retain a couple posteriors until placing prosthesis (esp if they are abutments for existing partial dents)
- in rare instances, immed dent is placed following removal of all teeth in arch (rare? huh?)
- NOTE: the more teeth removed to place immed dent → the less certain outcome → more rocky post-op course → more time spent w pt
 - Basically, for full arch immed dentures, REFER

ADV of Immed Dents	DISADV of Immed Dents
--------------------	-----------------------

✓ Esthetics ✓ Ease/reliability of replication of pts jaw relations, esp of VDO ✓ More comfy post-op course (dent is protecting odontectomy surg sites) ✓ Internal contours of denture guid contours of healing ridge ✓ Less post-op bleeding ✓ 1st time dent pt adapts better to immed dent than to conventional dent (even gaggers)	▪ \$\$\$\$\$ ▪ no opportunity to try in immed dent for esthetic eval, so can't make changes prior to completion
--	--

Impressions for Immediate Dentures: (NOVA PROTOCOL)

- wait for odontectomy site to heal (6 wks)
- make prelim alginate impressions of arches in unmodified stock/disposable tray
 - elastic material used bc deep undercuts usually present from remaining natural teeth
 - should be overextended at peripheries
 - must record: tuberosities, retromolar pad, frena, all vestibules
 - anterior flange of tray will—
 - provide 4-6 mm space facial to remaining anteriors
 - borders of tray posterior to anteriors must be opposite + occl to vestibular sulci
 - do NOT border mold
- microstone= recommended cast material

If you fail 3 times→ make custom tray for final impression:

- use preliminary cast...
 - draw pencil line at maximum depth of peripheral borders
 - draw 2nd line 3 mm occl to other line
 - mark posterior border of max arch—straight line form hamular notch to hamular notch
 - make spacer of 3-layer baseplate wax over all remaining teeth + 2-layer wax on tiss surface of ridge
 - wax ends at 3 mm depth line of facial aspect
 - wax ends at 3mm lingual to ging margins on ling aspect
 - model releasing agent... TRIAD... cure... air barrier... cure... add handle... etc
 - make a bunch of evenly spaced holes in tray to aid w retention
- now at pt appt...
 - border mold w green stick compd
 - apply alginate tray adhesive
 - dry palate w gauze
 - mark vibrating line intraorally (ham notch to ham notch)
 - make alginate impression + send pt home
 - pour microstone cast in 2 stages (DO NOT BOX)
 - make record base w pink TRIAD

Cast modifications + Tooth Arrangement for Immed Dent:

- Goal= provide space for placement of artifice tooth + eliminate need for aggressive alveoplasty (fig 1E+F)
- 4 phases:

1. predetermined tooth removed from cast (fig 1B)
 2. join lingual ging margin to intermediate line on facial surface (fig 1c)
 - trim alveolar ridge anticipating amt of trimming to be done in surgery
 3. place artificial teeth in approp position one at time (but alternate sides of cast so 2 adj teeth can serve as guides)
 - use existing teeth to guide position of incisal edges
 4. wax base removed from cast + stone contours rounded
- modification extends from line identifying undercut to line identifying lingual ging margin (fig 1D)
 - don't forget to arrange in balanced occl

Fabricating Immed Dentures: pretty much same as making complete dent

Surgical Templates:

- thin, transparent acrylic resin base shaped to duplicate form of impression surface of immed dent
- discloses areas of alveolar process that must be surgically trimmed before inserting immed dent
- must specially request in Rx: "duplicated casts for surg templates"
- lab tech makes it after all req cast alterations made
- 2 layer thick Vacuform stent used
- mark border of template 2 mm short of vestibule depth
- place immed dent + template in H₂O until needed

CH. 30 OTHER DENTURE SERVICES

REPAIRING FRACTURED DENTURES:

- lute together broken pieces w sticky wax on external surfaces
- denture only needs to contact cast in area of fracture ☑ fill all undercuts
- pour cast ☑ denture must remain upright until stone sets (do NOT invert)
- remove dent from cast + remove sticky wax
- widen fracture line: cut away on BOTH sides adj to fracture
 - o roughen/rabbet/dovetail edges to increase mechanical retention
- if teeth are to be replaced ☑ enlarge sockets on LINGUAL side
- SELF-CURING acrylic resin used to fill in fracture (do NOT flask nor heat)
 - o Over-contour repair area to allow for shrinkage
 - o Adapt tinfoil over repaired area ☑ place ring-liner material over to hold in place during polymerization
 - o Polymerize in air-pressure pot submerged in WARM H₂O under 30 lbs pressure/sq inch for 15 min ☑ polish

REPLACING TEETH:

- Loose teeth (not chipped/fractured) are just reattached in original position
- Fractured teeth are cut away w burs
 - o Cut away acrylic resin from LINGUAL side (leave facial untouched if possible)
 - o Dovetail area for retention
 - o Replace w new tooth (record mold # in pt chart!) ☑ attach to adjacent teeth w sticky wax on facial surface
 - o Add self-curing acrylic resin ☑ polymerize

RELINES= resurfacing tiss side w new base material (due to tiss changes in support areas)

- Remove enough denture periphery to make 2 mm of space for border molding
- Remove undercuts
- Make impression of tiss surface USING DENTURE AS TRAY
 - Pt must keep teeth in occlly while material sets
- Pour stone cast 🟡 sent to lab for reline (do NOT separate dent from cast!)
- Impression material is replaced w acrylic resin (dough stage... trial packing..etc)

NOTE: If relining both arches→ reline LEAST STABLE 1st

REBASING= replacing most of denture base material w/o changing occl (due to tiss changes, damaged base/teeth)

- ALL old acrylic resin removed except just enough to hold teeth in one U-shaped piece